

NATIONAL AERONAUTICS AND SPACE ADMINISTRATION

**FISCAL YEAR 2003 ANNUAL PERFORMANCE REPORT TO
THE WHITE HOUSE INITIATIVE OFFICE ON
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES**

Office of Education
April 2004

**NATIONAL AERONAUTICS AND SPACE ADMINISTRATION (NASA)
FISCAL YEAR 2003 ANNUAL PERFORMANCE REPORT
TO THE WHITE HOUSE INITIATIVE OFFICE ON
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES (HBCU)**

TABLE OF CONTENTS

	Page
A. EXECUTIVE SUMMARY	3
B. SUMMARY OF AGENCY AWARDS TO HCBU'S BY CATEGORY	4
FY 2003 Discretionary Awards	
C. SUMMARY OF AWARDS BY INSTITUTION	6
D. AWARDS BY OBJECT CATEGORY	9
Research and Development	10
Program Evaluation	15
Training	17
Facilities and Equipment	19
Fellowships, Traineeships, Internships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)	20
Student Tuition Assistance, Scholarships, and Other Aid	21
Direct Institutional Subsidies	22
Third-Party Awards	23
Private-Sector Involvement	24
Administrative Infrastructure	25
Other Activities	26
AWARDS AND EXEMPLARY PROJECTS	28
University Research Centers	28
Faculty Awards for Research	32
Mathematics, Science, and Technology Awards for Teacher and Curriculum Enhancement Program	34
Precollege Achievement of Excellence in Science, Mathematics, Engineering, and Technology	36
Minority Institutions for Excellence	39
Partnership Awards for the Integration of Research into STEM Undergraduate Education	41
Network Resources Training Sites	44
NASA Exemplary Partnership	47
NASA CENTER AND ENTERPRISE INVOLVEMENT	50

EXECUTIVE SUMMARY

The National Aeronautics and Space Administration (NASA) has a commitment to ensure that Historically Black Colleges and Universities (HBCU) broaden their participation in the Agency's research programs and its overall mission. The goals for HBCUs emphasized by NASA in Fiscal Year (FY) 2003 were as follows:

- Facilitate research and development activities at HBCUs that contribute substantially to NASA's mission and that inspire participating underrepresented minority students to become scientists, mathematicians, engineers, and technologists in NASA-related fields.
- Create systematic and sustainable change at HBCUs through partnerships and programs that create research capabilities where they are limited or nonexistent, and enhance the institution's existing research capabilities to reach the competitive mainstream.
- Prepare faculty and students at HBCUs to successfully participate in the competitive research and educational processes of the NASA Strategic Enterprises.
- Engage underrepresented minority students, educators, and researchers in NASA's education program.
- Provide HBCU educators with unique teaching tools and compelling teaching experiences.
- Partner with HBCUs to increase the number of students who are prepared to enter college and successfully pursue and complete the curriculum requirements for undergraduate degrees in NASA-related fields.

NASA's commitment is evidenced by the significant progress made toward the Agency's FY 2003 Annual Plan to Assist HBCUs. NASA's investment in HBCUs grew from its planned investment of \$53.5 million for FY 2003 to an actual investment of \$65.7 million, a 22.8-percent increase over the expected investment. The primary reason for the increased FY 2003 funding was more technical assistance and outreach to the HBCU community. Evidence of the Agency's funding commitment is seen in the research that was conducted through University Research Centers, Faculty Awards for Research, and research-oriented Partnership Awards programs. Further evidence is the expanded participation of HBCUs in the Curriculum Improvement Partnership Award program. As a result of sustained NASA funding in FY 2003, HBCUs reported 362 refereed publications, 2 patents, 16 copyrights, and 13 African Americans who received doctoral degrees in NASA-related scientific and technical areas.

During FY 2003, HBCUs were recognized nationally for their outstanding accomplishments and increased participation in NASA's Strategic Enterprise activities. For example, Hampton University's Aeronomy of Ice in the Mesosphere (AIM) mission for flight under the Small Explorers (SMEX) Program distinguished Hampton University as the first HBCU to have the lead responsibility for conducting a flight mission. It is important to note that this selection came as a result of peer-reviewed, open competition among all categories of domestic institutions. Hampton earned the privilege of flying this mission on the scientific and technical strength of their initial proposal and subsequent concept study report. Additionally, the Space Medicine and Life Sciences Research Center (SMLSRC) at the Morehouse School of Medicine was recognized for providing education and training to students and faculty at the undergraduate, graduate, and post-graduate levels in support of the achievement of routine space travel to enrich life on Earth through the use of space technology and the application of biomedical knowledge. The Space Flight and Gravitational Biology Research Program at the SMLSRC consists of cardiovascular, musculoskeletal, cell biology, circadian rhythm, immunology, tissue technology, reproductive physiology, and signal transduction projects. Morgan State University's Center for Advanced Microwave Research and Applications (CAMRA) was also recognized for its outstanding accomplishments. CAMRA consists of two research branches, the Center for Microwave Satellite and RF Engineering (COMSARE) and the Semiconductor Center for Electronic Devices and Circuits (SCEDC), which provide NASA's future Earth and Space Science missions with a technology base for the production of microwave components and systems such as RFICs (amplifiers, mixers, LOs) and low-power digital logic.

NASA values its partnership with HBCUs and the contributions they make to the Agency's mission and the scientific endeavors of the Nation. NASA commends the HBCUs on the training provided to future scientists, mathematicians, engineers, and technicians for NASA and the Nation.

SUMMARY OF AGENCY AWARDS TO HBCUs BY CATEGORY: FY 2003

1. Agency: National Aeronautics and Space Administration
2. Agency Representative: Adena Williams Loston _____
Associate Administrator for Education (Signature)
3. Total Funds for Institutions of Higher Education (IHE): **\$1,255,917,925**

DISCRETIONARY AWARDS

CATEGORY	AWARDS TO IHEs+	AWARDS TO HBCUs*	AWARDS TO HBCUs AS % OF TOTAL AWARDS TO IHEs
1. Research & Development	\$1,096,248,071	\$33,085,486	3.02%
2. Program Evaluation		\$45,831	
3. Training	\$39,581,211	\$12,046,419	25.38%
4. Facilities and Equipment	\$710,320	\$576,606	81.17%
5. Fellowships, Internships, Traineeships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)		\$2,610,770	
6. Student Tuition Assistance, Scholarships, and Other Aid		\$3,570,000	
7. Direct Institutional Subsidies			
8. Third-Party Awards		\$9,561,455	
9. Private-Sector Involvement		\$1,100,000	
10. Administrative Infrastructure			
11. Other	\$119,378,323	\$5,139,556	4.31%
TOTAL	\$1,255,917,925	\$65,736,123	5.23%

Sean O'Keefe
Administrator

(Signature)

+ IHE=Institutions of Higher Education
* HBCUs=Historically Black Colleges and Universities

**TOTAL FY 2003 AWARDS TO
HISTORICALLY BLACK COLLEGES AND UNIVERSITIES**

	<i>Institutions of Higher Education</i>	<i>Historically Black Colleges and Universities</i>
DISCRETIONARY AWARDS:	\$1,255,917,925	\$64,439,498
LEGISLATED AWARDS:	\$0	\$1,296,625
TOTAL AWARDS:	\$1,255,917,925	\$65,736,123

FY 2003 SUMMARY OF AGENCY AWARDS TO HBCUs BY INSTITUTION

[illegible]

STATE/INSTITUTION	R&D	PE	TRAINING	F&E	FELLOWS	STA	DIS	TPA	PSI	AI	OTHER	TOTAL
SOUTH CAROLINA												
Claflin College											\$100,000	\$100,000
South Carolina State University			\$905,505									\$905,505
TENNESSEE												
Meharry Medical College					\$111,137							\$111,137
Tennessee State University	\$1,619,028		\$432,400								\$1,300,298	\$3,351,726
TEXAS												
Prairie View A&M University	\$1,432,895		\$414,367									\$1,847,262
Texas College	\$150,213										\$99,785	\$249,998
Texas Southern University	\$1,200,000											\$1,200,000
VIRGINIA												
Hampton University	\$10,685,708		\$544,998	\$500	\$1,315,068							\$12,546,274
Norfolk State University	\$1,400,000		\$1,409,975								\$48,585	\$2,858,560
WEST VIRGINIA												
West Virginia State College		\$45,831			\$965							\$46,796
OTHER HBCU AWARDS												
American Society for Engineering Education								\$30,000				\$30,000
Global Science & Technology, Inc./NASA Peer Review Services									\$1,100,000			\$1,100,000
Louisiana Research Consortium								\$16,495				\$16,495
Minority Access, Inc.								\$950,000				\$950,000
Mississippi Community College Foundation								\$50,000				\$50,000
Mississippi Research Consortium								\$120,499				\$120,499
Mississippi Space Commerce Initiative								\$235,831				\$235,831
National Action Council for Minorities in Engineering (NACME)								\$855,000				\$855,000
National Association for Equal Opportunity in Higher Education (NAFEO)								\$1,511,787				\$1,511,787
Paragon Tech, Inc. – Science, Engineering, Mathematics and Aerospace Academy (SEMAA)								\$1,050,000				\$1,050,000
Space Grant College Fellowship Program								\$519,460				\$519,460
Summer High School Apprentice Research Program (SHARP) PLUS								\$260,000				\$260,000
Tennessee State University – Diversified Career and Educational Services (DCES)								\$770,000				\$770,000
United Negro College Fund Special Programs, Inc.								\$3,192,383				\$3,192,383
GRAND TOTAL	\$33,085,486	\$45,831	\$10,046,419	\$576,606	\$2,610,770	\$3,570,000		\$9,561,455	\$1,100,000		\$5,139,556	\$65,736,123

ABBREVIATIONS KEY	
R&D	Research & Development
PE	Program Evaluation
TRAINING	Training
F&E	Facilities and Equipment
FELLOWS	Fellowships, Traineeships, Internships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)
STA	Student Tuition Assistance, Scholarships, and Other Aid
DIS	Direct Institutional Subsidies
TPA	Third-Party Awards
PSI	Private-Sector Involvement
AI	Administrative Infrastructure
OTHER	Other Activities

AWARDS

BY

OBJECT

CATEGORY

AWARDS BY OBJECT CATEGORY

Research and Development

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Alabama A&M University	Infrastructure for the Research Involving Novel Solid-State Based Piezoelectric Transformers	\$50,000
AL	Alabama A&M University	Development of High Performance Nano-Composite Pyroelectric Uncooled Infrared Sensors	\$24,000
AL	Alabama A&M University	Advanced Space Propulsion Materials Research	\$447,000
AL	Alabama A&M University	Center for Hydrology, Soil Climatology, and Remote Sensing (HSCARS)	\$1,199,979
AL	Alabama A&M University	Characterizing Electro-Optical Properties	\$100,000
AL	Alabama A&M University	Development of a Robust Fem Properties for Rocket Acoustics Problems	\$50,000
AL	Alabama A&M University	Fabrication, Optical and Electrical Characterization of the Diffractive Holographic Optical Elements	\$24,000
AL	Alabama A&M University	Optical Studies in Polymer Optical Fibers: Dye-Dropped Polymer Optical Fibers and Fabrication	\$99,901
AL	Alabama A&M University	Research and Development, National Space Science and Technology Center	\$482,000
AL	Alabama A&M University	Splicing Technology for Optical Fiber Cables/ Based on Optical Beam Self Trapping in Photo Curable Polymers	\$50,000
AL	Oakwood College	Development of Ultra-Light Normal Incidence Mirror Electrochemical Aspects	\$5,388
AL	Tuskegee University	A Nonlinear Model for Fuel Atomization in Spray Combustion	\$84,450
AL	Tuskegee University	Center for Food and Environmental Systems for Human Exploration of Space (CFESH)	\$1,200,000
AL	Tuskegee University	Development and Assessment of a Novel Training Package for Basic Maneuvering Tasks on a Flight Simulation	\$99,289
AL	Tuskegee University	Electrical Issues in Nuclear Electric Propulsion Systems	\$99,204
AL	Tuskegee University	Photocoltac System for Experimental Solar Energy Efficient House	\$47,000
AL	Tuskegee University	Survivability of Affordable High Temperature Polymer Matrix Composites for Propulsion Engine Components	\$100,000
AL	Tuskegee University	Turbulence Modeling	\$99,726
DC	Howard University	Detection, Diagnosis, Location and Recommendation of Remedial Actions for Corona/Soft Faults	\$93,517
DC	Howard University	Evaluating IR Radiative Transfer	\$99,983
DC	Howard University	Hierarchical Algorithms & Their Embedded Computational Realization in Reconfigurable Hardware	\$234,475
DC	Howard University	Howard University West Africa Rainfall Analysis	\$60,000

STATE	INSTITUTION	DESCRIPTION	AWARD
DC	Howard University	Impact of Soil Moisture Initialization on Seasonal Precipitation Forecasts in West Africa	\$24,000
DC	Howard University	Nanocomposite-Based Compact Thermomagnetic Cryocoolers	\$133,505
DC	Howard University	NASA/HBCU Renewable Energy and Teaching Utilization Project	\$500,000
FL	Florida A&M University	Collision Processes in Astrophysical Plasmas	\$175,427
FL	Florida A&M University	Active Control of Boundary-Layer Separation and Flow Distortion in Adverse Pressure Gradient Flows	\$80,852
FL	Florida A&M University	Active-Adaptive Control of Inlet Separation Using Supersonic Microjets	\$89,101
FL	Florida A&M University	Control of Dynamic Stall Process on Helicopter Rotor Blades Using Distributed Multiple Microjets	\$99,974
FL	Florida A&M University	Design & Control of Cobot Master Manipulator for a Telerobotic System	\$199,474
GA	Clark Atlanta University	A 3-D Dispersion Model for Mobile Source Emissions	\$11,025
GA	Clark Atlanta University	Commercial Process Development for Polyimide Foams	\$75,000
GA	Clark Atlanta University	Computational Models in Vision Bridges Between Biological Vision and Computer Vision	\$97,800
GA	Clark Atlanta University	Developing Novel Fluorescent Materials with Near Infrared Emission by Using M-Pheylene	\$51,197
GA	Clark Atlanta University	Electron Collision Rates of Atoms & Ions for Application to Atmospheres of Planets & Their Satellites	\$60,000
GA	Clark Atlanta University	Electron Collisional Excitation Strengths for Ions of Astrophysical Interest	\$65,000
GA	Clark Atlanta University	High Performance Polymers and Composites Center	\$1,199,854
GA	Clark Atlanta University	In Support of NASA Studies of Precipitation Anomalies from Widespread Urban Land Use (Sprawl) Project	\$29,999
GA	Clark Atlanta University	Liquid Fuels: Pyrolytic Degradation and Fire Spread Behavior as Influenced by Buoyancy	\$60,000
GA	Clark Atlanta University	Multiscale Modeling of Metallic Alloys	\$99,960
GA	Clark Atlanta University	Resin Transfer Molding and Vacuum Assisted Resin Transfer Molding Program	\$50,000
GA	Clark Atlanta University	Simulation of Cavitating Flows Using Mixed Discontinuous Galerkin and Stabilized Galerkin	\$75,000
GA	Morehouse School of Medicine	Gravitational Effects on Nutrient Diffusion Through Cartilage Matrix	\$100,000
GA	Morehouse School of Medicine	Space Medicine and Life Sciences Research Center	\$1,200,000

STATE	INSTITUTION	DESCRIPTION	AWARD
GA	Morehouse School of Medicine	Telemedicine Application of Autogenic Feedback Training Exercise as a Treatment for Specific Patients	\$146,869
GA	Spelman College	Raman-Based Oxygen and Nitrogen Sensor for Monitoring Empty Airplane Fuel Tanks	\$70,399
LA	Southern University and A&M College-Baton Rouge	Integrated Approach to Reasoning Under Multiple Perspectives	\$90,000
LA	Southern University and A&M College-Baton Rouge	The Center for Coastal Zone Assessment and Remote Sensing	\$1,098,507
LA	Southern University-New Orleans	Input/Output Data Management for Earth Science Hyperspectral Data	\$10,000
MD	Bowie State University	Biomolecular Recognition of Fullerenes and Carbon Nanotubes	\$100,000
MD	Bowie State University	Continued Support of EOS-IDS Urban Impacts on Global Productivity	\$46,958
MD	Morgan State University	Advanced CFD Analysis/Experimental Validation and Transient Model Development for the Flow in SSME	\$79,828
MD	Morgan State University	Center of Advanced Microwave Research and Applications	\$1,037,536
MD	Morgan State University	Chesapeake Information-Based Aeronautics Consortium	\$2,981,000
MD	Morgan State University	Cost Reduction for Multiple Production Runs of Nanosats	\$72,275
MD	Morgan State University	Image Registration and Fusion for Future Formation Flying Systems	\$18,000
MD	Morgan State University	Polymerization of Advanced Thermosets in Microgravity to Develop Ultra Low Polymers	\$99,983
MD	Morgan State University	Radio Frequency Analog-to-Digital Converter	\$93,955
MS	Jackson State University	Network Storage Management in the Data Grid Environment	\$75,000
MS	Jackson State University	Non-Contract Precision Actuation and Structural Control Using Opto-Mechanical Actuators	\$98,143
NC	Elizabeth City State University	Application of Chaos Theory in NASA's Advanced Communications Systems	\$25,000
NC	Elizabeth City State University	Mathematics of the Great Dismal Swamp	\$625
NC	Elizabeth City State University	The Use of Proteomics to Analyze Antioxidant and Phosphoinositol Signal Transduction Pathway(s)	\$81,691
NC	North Carolina A&T State University	Analytic Solution Algorithms & Simulation for Compressible Flow Models: Computational Benchmarks	\$100,000
NC	North Carolina A&T State University	A Wireless Radio Location System for Use in an Indoor Environment	\$99,242
NC	North Carolina A&T State University	Advanced Cross Enterprise Technology	\$290,000
NC	North Carolina A&T State University	Calibration and Processing: SeaWiFS Data Collection	\$50,000
NC	North Carolina A&T State University	Continuous Sensor for Fuel Tank Health Monitoring	\$99,718

STATE	INSTITUTION	DESCRIPTION	AWARD
NC	North Carolina A&T State University	Developing Ultra-Efficient Engine Technology Through Education and Research	\$120,000
NC	North Carolina A&T State University	Investigation of the Next-Generation Design Tool for Aerospace	\$83,040
NC	North Carolina A&T State University	Low-Power RF SOI-CMOS Technology for Distributed Sensor Networks	\$1,352
NC	North Carolina A&T State University	Performance Evaluation & Modeling of Affordable Composites Manufactured Using Stitching & Z-Pinning Processes	\$100,000
NC	North Carolina A&T State University	Study of GAASSBN Alloys for Solar Cell Applications	\$99,996
OH	Central State University	Analysis and Development of a Sicipiezoresistive Probe for Measuring Turbulent Intensity	\$101,445
TN	Tennessee State University	Center for Automated Space Science	\$1,472,028
TN	Tennessee State University	Embodiment of Intelligent Behaviors on Mobile Robots	\$147,000
TX	Prairie View A&M University	Center for Applied Radiation Research	\$1,200,000
TX	Prairie View A&M University	Center for Applied Radiation Research Partnership Program	\$15,581
TX	Prairie View A&M University	Develop a Daily Observations & Research Program at Prairie View Solar Observatory	\$70,000
TX	Prairie View A&M University	Effects of Service Conditions on the Properties and Morphology of Advanced Composites for Cryogenic Applications	\$98,314
TX	Prairie View A&M University	Substorm Evolution in the Near-Earth Plasma Sheet	\$49,000
TX	Texas College	Mathematics, Science, Engineering, and Technology Place for Faculty	\$99,813
TX	Texas College	Tectonic Evolution of Planetary Surfaces	\$50,400
TX	Texas Southern University	NASA Research Center for Technology & Environmental Health	\$1,200,000
VA	Hampton University	A Complete Adaptive Digital Signal Processing System	\$98,279
VA	Hampton University	Center for Lidar & Atmospheric Sciences	\$27,227
VA	Hampton University	Concept Study for the "Aeronomy of Ice in the Mesosphere" (AIM) Mission	\$1,800,000
VA	Hampton University	Contrail Tracking and ARM (Atmospheric Radiation Measurements) Data Product Development	\$114,829
VA	Hampton University	Definition Activities (Phase B) for the Aeronomy of Ice in the Mesosphere (AIM) Spaceflight Mission	\$6,461,412
VA	Hampton University	Hampton University Aeropropulsion Center	\$1,116,292
VA	Hampton University	Heliospheric Hydrogen and Helium	\$65,341
VA	Hampton University	Parametric Generation of Tunable Radiation for Remote Sensing Applications	\$50,000
VA	Hampton University	Picasso-Cena International Science Advisory Panel, Science Activities, Algorithm Implementation	\$273,800
VA	Hampton University	Real-Time Very High Resolution Regional 4D Assimilation in Supporting NASA Crystal-Face Experiment	\$65,582

STATE	INSTITUTION	DESCRIPTION	AWARD
VA	Hampton University	Research Center for Optical Physics	\$31,000
VA	Hampton University	Theoretical & Observational Determinants of Global & Regional Radiation Budget, Forcing & Feedback Top-of-Atmosphere	\$390,315
VA	Hampton University	Timed Phase E Saber - Russell	\$134,714
VA	Hampton University	Top-of-Atmosphere Albedo Estimation From Polder Multi-Angle Measurements: Evaluation of Water	\$56,917
VA	Norfolk State University	Analysis of Fluid-Structure Interaction	\$100,000
VA	Norfolk State University	Center for Research and Education in Advanced Materials	\$1,200,000
VA	Norfolk State University	Power Allocation & Distribution (Pad) Logic Circuit /Smart Membrane Actuators Controlled by a Microwave	\$100,000
TOTAL			\$33,085,486

AWARDS BY OBJECT CATEGORY

Program Evaluation

STATE	INSTITUTION	DESCRIPTION	AWARD
WV	West Virginia State College	The Development of a Collaborative Relationship between West Virginia State College & the NASA IV and V Facility	\$45,831
TOTAL			\$45,831

In FY 2003, NASA adopted six Operating Principles (i.e., Customer Focus, Content, Pipeline Diversity, Evaluation, and Partnership/Sustainability) by which all grant awards are evaluated. The Office of Education developed and implemented a review process using the six Operating Principles in which all NASA education and research programs over \$100,000 were evaluated. Three separate reviews were conducted: (1) NASA Headquarters programs, (2) Strategic Enterprise programs, and (3) Center programs. All programs will be evaluated annually against the Operating Principles. The results will be used to determine which programs are effective, cost-efficient or need improvement.

Performance Outcomes

In order to monitor the progress of NASA HBCU programs, all grant recipients were required to submit a Performance Outcomes Report as part of their annual performance report. The Performance Outcomes Report consists of both numerical outcomes data and a narrative summary of project accomplishments covering Academic Year (AY) 2002-2003 and the summer of 2002. The data were collected electronically via the World Wide Web. This single annual collection of data is used to provide the information necessary for annual Minority University Research and Education Programs (MUREP) reports, required White House reports, budget submissions and justifications, and responses to congressional inquiries and comparative assessments of programs and projects.

The numerical data measure program performance against metrics that apply to all NASA MUREP projects. These metrics reduce the collection of data to the minimal amounts possible, emphasize outcome over process, and are applicable to any project. They are aggregable both horizontally and longitudinally, and they allow adjustable benchmarking standards to be applied. For research projects, including University Research Centers (URC), Institutional Research Awards (IRA), and Faculty Awards for Research (FAR), the metrics track two basic areas--student outcomes (degrees awarded and post-degree plans), and research outcomes (refereed publications, leveraged funding, patents, and commercial products). Vital process information, such as numbers of faculty and students supported and the gross categories in which funds are spent, is also collected. For education projects, the Performance Outcomes Report not only continues to collect data on numbers and demographics of students supported, but also primarily focuses on measurable

improvements in student performance. Both short-term metrics and long-term metrics are utilized in the collection of data that pertains to education projects. The narratives on each project provide information on accomplishments that are relative to that project, and therefore, are not necessarily captured in the Performance Outcomes data. These narratives serve as input for the annual HBCU Performance Report and other similar reports, as required.

Site Visits

Independent peer reviewers conducted onsite reviews of grants at many HBCUs during FY 2003. The purposes of the visits were to ascertain the projects' accomplishments to date, identify any potential barriers to achieving project objectives, determine whether collaboration between the institution and NASA is sufficient to achieve maximum benefits for the university and for NASA, and to allow NASA personnel an opportunity to review the financial management of the grant.

AWARDS BY OBJECT CATEGORY

Training

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Alabama A&M University	Space Science Education and the Sun-Earth Connection	\$225,000
AL	Alabama A&M University	Urban Sprawl and the Development of a Leapfrog Index	\$24,000
AL	Oakwood College	Minority Student Development Program in Science and Engineering (MISE)	\$100,000
AL	Tuskegee University	NASA Spaceflight and Life Sciences Training Program	\$313,308
AL	Tuskegee University	NASA's SLSTP Academic Partner Alliance (NSAPA)	\$180,000
FL	Bethune-Cookman College	Center for Space Education	\$443,000
FL	Florida A&M University	Collision Processes in Astrophysical Plasmas	\$175,427
GA	Clark Atlanta University	Clark Atlanta University and Partners Center for Preparing Mathematics and Science Teachers	\$195,240
GA	Spelman College	Spelman College Model Institutions for Excellence (MIE)	\$1,000,000
GA	Spelman College	Building Capital in the Sciences: Technology-Based Instructional Laboratory Design and Distance Education	\$127,861
LA	Southern University & A&M College-Baton Rouge	Partnerships in Astronomy & Astrophysics Education & Research	\$185,000
LA	Xavier University	2003 Pre-Service Teacher Institute (PSTI)	\$58,494
MD	Bowie State University	Bowie Seeks to Integrate the Wire Mission into Its BSOCC Program to Provide Opportunities to Students	\$77,500
MD	Bowie State University	Model Institutions for Excellence (MIE)	\$2,020,000
MD	Morgan State University	NRTS Continuation/MU-SPIN NRTS Program	\$350,000
NC	Elizabeth City State University	NRTS Continuation/MU-SPIN NRTS Program	\$350,000
NC	Fayetteville State University	Pre-Service Professional Development Model for Partnership & Change	\$90,000
NC	North Carolina Central University	Integration of Nanotechnology and Computational Modeling NASA-Related Research into the Undergraduate Curriculum	\$100,000
NC	North Carolina Central University	NCCU Center of Excellence	\$499,771
SC	South Carolina State University	Enhancement of the Space Science Research Program at South Carolina State University	\$245,000
SC	South Carolina State University	The Center for NASA Research and Technology (CNRT)/MU-SPIN NRTS Program	\$350,000
SC	South Carolina State University	Curriculum Enhancement Through Space Science Research	\$310,505
TN	Tennessee State University	NASA/TSU Minority Universities Information Network For Research & Education/MU-SPIN NRTS Program	\$350,000
TN	Tennessee State University	TSU Research Projects for Increasing the Pool of Minority Engineers	\$82,400
TX	Prairie View A&M University	2003 Pre-Service Teacher Institute (PSTI)	\$55,000

STATE	INSTITUTION	DESCRIPTION	AWARD
TX	Prairie View A&M University	NASA Southwest Regional Network Resources and Training Site/MU-SPIN NRTS Program	\$359,367
VA	Hampton University	A Space Science Curriculum at Hampton University: Development of a Minor, Faculty Enhancement, and K-14 Outreach	\$244,998
VA	Hampton University	Hampton University College of Continuing Education Aerospace Center	\$300,000
VA	Norfolk State University	2003 Pre-Service Teacher Program (Institute and Conference)	\$346,836
VA	Norfolk State University	2003 Pre-Service Teacher Program	\$561,986
VA	Norfolk State University	A NASA-HBCU Partnership to Enhance Minority Education & Research Participation in the Space Sciences	\$201,673
VA	Norfolk State University	Mission-Leveraged Education: NSU-NASA Innovative Undergraduate Model (MiLEN ² IUM), a NASA PAIR Project	\$299,480
TOTAL			\$10,046,419

AWARDS BY OBJECT CATEGORY

Facilities and Equipment

STATE	INSTITUTION	AWARD
AL	Alabama A&M University	\$105,198
AL	Alabama State University	\$1,844
DC	Howard University	\$153,615
FL	Florida A&M University	\$189,601
GA	Morehouse College	\$91,628
MD	Bowie State University	\$1,800
MD	Morgan State University	\$10,064
PA	Cheyney University	\$22,356
VA	Hampton University	\$500
TOTAL		\$576,606

AWARDS BY OBJECT CATEGORY

Fellowships, Traineeships, Internships, Recruitment, and Arrangements under the Intergovernmental Personnel Act (IPA)

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Tuskegee University	NASA/Tuskegee University Internship Program	\$25,000
DC	Howard University	Goddard Space Flight Center/Howard University Fellowship in Atmospheric Science (GOHFAS)	\$220,000
DC	Howard University	Public Service Internship Program	\$53,600
DC	Howard University	Support of the 2003 ASEE-NASA Faculty Fellowship Program	\$380,000
FL	Bethune-Cookman College	Student Internship Program with Kennedy Space Center	\$55,000
FL	Florida A&M University	A Graduate Fellowship Component to Augment Program Image	\$350,000
MD	Bowie State University	Faculty Summer Fellowship	\$50,000
MD	University of Maryland-Eastern Shore	UMES Student Internships at NASA Wallops: An Outreach Proposal	\$50,000
TN	Meharry Medical College	NASA/Meharry/Vanderbilt Summer Research Apprenticeship Program	\$111,137
VA	Hampton University	Langley Aerospace Research Summer Scholars Program (LARSS) 2002	\$169,622
VA	Hampton University	NASA Summer Faculty Fellowship Program 2002	\$24,000
VA	Hampton University	Langley Aerospace Research Summer Scholars Program (LARSS) 2003	\$1,121,446
WV	West Virginia State College	NASA Science and Technology Scholar Program	\$965
TOTAL			\$2,610,770

AWARDS BY OBJECT CATEGORY

Student Tuition Assistance, Scholarships, and Other Aid

STATE	INSTITUTION	DESCRIPTION	AWARD
FL	Florida A&M University	Increasing Minority Access to the Graduate Engineering Program (IMAGE)	\$1,270,000
GA	Morehouse College	Strategic Preparedness Advancing Careers in Engineering/Science (Project SPACE)	\$1,150,000
GA	Spelman College	Women In Science And Engineering Scholars Program (WISE)	\$1,150,000
TOTAL			\$3,570,000

AWARDS BY OBJECT CATEGORY

Direct Institutional Subsidies

There were no grants funded specifically for Direct Institutional Subsidies at HBCUs during FY 2003.

AWARDS BY OBJECT CATEGORY

Third-Party Awards

American Society for Engineering Education (ASEE)	
Helen T. Carr Fellowship	\$30,000
National Association for Equal Opportunity in Higher Education (NAFEO)	
Louis Stokes Professional Leadership Program	\$484,307
NASA Summer Internship Program	\$127,480
NAFEO/NASA Research Academy	\$900,000
Minority Access, Inc.	
Paragon Tech, Inc. – Science, Engineering, Mathematics and Aerospace Academy (SEMAA)	\$950,000
United Negro College Fund Special Programs, Inc.	
Harriett G. Jenkins Predoctoral Fellowship Program	\$1,072,000
Curriculum Improvement Partnership Awards (CIPA)	\$897,683
NASA Administrator's Fellowship Program (NAFP)	\$1,222,700
Louisiana Research Consortium	
Mississippi Community College Foundation	\$16,495
Mississippi Research Consortium	\$50,000
Mississippi Space Commerce Initiative	\$120,499
Space Grant College Fellowship Program	
Summer High School Apprenticeship Research Program (SHARP) PLUS	\$235,831
Tennessee State University – Diversified Career and Educational Services (DCES)	
National Action Council for Minorities in Engineering (NACME)	\$519,460
THIRD-PARTY TOTAL	
	\$260,000
	\$770,000
	\$855,000
	\$9,561,455

AWARDS BY OBJECT CATEGORY

Private-Sector Involvement

ORGANIZATION	DESCRIPTION	AWARD
Global Science & Technology, Inc.	NASA Peer Review Services	\$1,100,000
TOTAL		\$1,100,000

NASA's Office of Education Programs, including the Minority University Research and Education Programs (MUREP) are supported by NASA Peer Review Services (NPRS), a consolidated contract, of which Global Science & Technology, Inc. is the prime contractor. NPRS' functions include the development and enhancement of an internet-based electronic management system to support solicitation development, peer review and selection, post-award evaluation, and grants/cooperative agreements management with HBCUs and Other Minority Universities (OMU). Additionally, NPRS provides technical assistance to HBCUs and ensures that they are familiar with and capable of accessing the NASA HBCU programs online via the electronic management system to receive announcements of opportunity and to submit proposals, evaluations, and post-award management activities.

AWARDS BY OBJECT CATEGORY

Administrative Infrastructure

There were no grants funded specifically for Administrative Infrastructure at HBCUs during FY 2003.

AWARDS BY OBJECT CATEGORY

Other Activities

STATE	INSTITUTION	DESCRIPTION	AWARD
AL	Alabama A&M University	Individuals with Disabilities (I Am Set)	\$75,000
AL	Alabama State University	Precollege Achievement of Excellence in Science, Technology, Mathematics, and Engineering (PACE/STEM)	\$100,000
AL	Oakwood College	Enhancing Mathematics and Science Education Through Research (EMSER)	\$379,583
AL	Oakwood College	Minority Explorer Program (MEP)	\$250,000
AL	Stillman College	Project Mi Futuro	\$99,818
GA	Albany State University	Precollege Achievement of Excellence in Science, Technology Mathematics, and Engineering (PACE/STEM)	\$99,107
GA	Morehouse College	Center for Excellence in Telecommunications and Space	\$846,625
GA	Paine College	Precollege Enrichment Program in Science, Mathematics, Engineering, and Technology	\$100,000
LA	Southern University & A&M College-Baton Rouge	Predictive Calculation and Simulation for Nanosemiconductors and Related Heterostructures for Aerospace	\$53,773
LA	Xavier University	SOAR 2 Summer Bridge Program	\$75,000
MD	Bowie State University	A 2003 Summer Institute in Engineering & Computer Applications (SIECA)	\$275,800
MD	Bowie State University	Bowie State's Science, Mathematics, Engineering & Technology Education Reform	\$1,100,000
MS	Jackson State University	Science and Mathematics Initiative for Learning Enhancement	\$27,382
NC	Fayetteville State University	Festival of Flight	\$100,000
PA	Lincoln University	NASA/Lincoln University Teacher Educational Partnership	\$8,800
SC	Claflin College	Astrochemical Project	\$100,000
TN	Tennessee State University	A Robotic Telescope for Student Research and Outreach	\$26,000
TN	Tennessee State University	The NASA Engineering and Science Collaborative	\$1,245,140
TN	Tennessee State University	TSU College Bound IV Program	\$29,158
TX	Texas College	Pre-College Placement for Achievement of Excellence In Math, Science, Engineering Technology	\$99,785
VA	Norfolk State University	NASA's Center of Excellence for Structures and Materials Technical Education Outreach	\$48,585
TOTAL			\$5,139,556

AWARDS

AND

EXEMPLARY

PROJECTS

AWARDS AND EXEMPLARY PROJECTS

NASA employs a comprehensive and complementary array of strategies to achieve its established goals for Minority Institutions (MI). These programmatic initiatives are carried out in close collaboration with the NASA Strategic Enterprises and Centers/Jet Propulsion Laboratory (JPL). The Strategic Enterprises and Centers/JPL support minority university programs through direct funding, use of their facilities, and commitment of their personnel to serve on Technical Review Committees (TRC) and assist in other facets of program implementation. As a result of the involvement of the Strategic Enterprises and NASA Centers/JPL in the MUREP, numerous students and principal investigators (PI) from MIs are knowledgeable about and make significant contributions to the aeronautics and space community.

Outreach to MIs will continue to be made in collaboration with the Strategic Enterprises and Centers/JPL to ensure that MIs are knowledgeable about and responsive to the Agency's Strategic Plan. The Office of Education will continue to set specific program goals that lead to measurable program outcomes that are consistent with the Agency's investment in MIs. NASA awards targeted at MIs are listed below.

University Research Centers (URC)

The URC awards are collaborative programs conducted in cooperation with the Strategic Enterprises. These awards are designed to achieve a broad-based, competitive aerospace research capability among the Nation's MIs that will foster new aerospace science and technology concepts; expand the Nation's base for aerospace research and development; develop mechanisms for increased participation by faculty and students in mainstream research; and increase the productivity of students (who are U.S. citizens and who have historically been underrepresented) with advanced degrees in NASA-related fields.

The 10 HBCU URCs achieved the following outcomes in AY 2002-2003 and the summer of 2002:

- 350 students from underrepresented minority groups participated in URC research
- 83 faculty members, 59 research associates, 91 graduate assistants, and 9 postdoctoral researchers conducted NASA-related research at URCs
- 79 degrees in science, technology, engineering or mathematics (STEM) disciplines were awarded to disadvantaged/underrepresented students as follows: 44 bachelors degrees, 24 masters degrees, and 11 doctoral degrees
- 148 refereed papers and/or book chapters were published or accepted for publication, including 47 with at least one student author

- 252 technical presentations, 108 which included at least one student presenter
- 1 patent is pending
- Students and faculty members participated in 82 panels, 5 sponsored by MUREP, 17 by other NASA programs, and 60 by other Federal agencies
- 72 research partnerships were developed

HBCU URCs include the following institutions: Alabama A&M University, Clark Atlanta University, Florida A&M University, Hampton University, Howard University, Morehouse School of Medicine, North Carolina A&T State University, Prairie View A&M University, Tennessee State University, and Tuskegee University.

An Exemplary URC

MOREHOUSE SCHOOL OF MEDICINE

Space Medicine and Life Sciences Research Center (SMLSRC)

PROGRAM DESCRIPTION

The SMLSRC is designed to conduct research relevant to the survival of humans traveling far from Earth, to enrich life on Earth using NASA technology, and to train the next generation of scientists and space travelers. The research program of the SMLSRC uses three space flight models to study probable physiological responses of astronauts: head-down tilt bed rest, the hind limb suspended rat, and the rotating wall vessel. The research program is comprised of three core cardiovascular projects: 1) a head-down tilt bed rest study (African-American subjects) that examines cardiovascular alterations; 2) a hind limb suspended rat model study that examines mechanisms and potential countermeasures to the cardiovascular alterations; and 3) a cell biology project that examines the signal transduction pathways that mediate the response of vascular cells to gravitational changes. A synergy project examines alterations in the calcium endocrine system of the subjects participating in the head-down tilt bed rest study and a synergy project examines alterations in the beta-adrenergic system and in the oxidative state of the hind limb suspended rats. The sixth project tests whether three-dimensional retinal structures for tissue transplantation can be engineered from human fetal retinal precursor cells grown in the NASA rotating wall vessel (bioreactor). Twelve faculty members, two postdoctoral fellows, and six research assistants conduct the research. The SMLSRC training program includes doctoral, medical, undergraduate, and high school students, who are active participants in the research projects.

PROGRAM RELEVANCE TO NASA

The studies of the SMLSRC support the aims of NASA's Office of Biological and Physical Research to assure the survival of humans traveling far from

Earth and to enrich life on Earth through the use of NASA technology. The research program of the SMLSRC will lead to the development of countermeasures for the cardiovascular alterations and muscle and bone loss experienced by astronauts during space flight.

PROGRAM BENEFITS TO SOCIETY

The SMLSRC is contributing information on cardiovascular functions in African Americans, a population with a higher rate of hypertension and salt sensitivity compared with the Caucasian American population. The use of rotating wall vessels (bioreactors) is proving valuable in generating three-dimensional tissues for scientific research projects and transplantation. The retinal tissue transplantation project will provide tissue for treatment of two eye diseases, retinitis pigmentosa and macular degeneration. The SMLSRC will also benefit society by providing information toward the treatment and prevention of musculoskeletal problems, such as osteoporosis and the muscle and bone loss experienced by patients who must undergo extensive bed rest. The SMLSRC is training future biomedical scientists, physicians, and space travelers.

PROGRAM GOALS

The overall goals of the SMLSRC are 1) to support the achievement of routine space travel and enrich life on Earth through the use of space technology and the application of biomedical knowledge, 2) to improve the rates for which US citizens who have been historically underrepresented in NASA-related fields are trained in space medicine and life sciences, and awarded advanced degrees in biomedical sciences, and 3) to foster the development of faculty members engaged in space-related biomedical research by providing scientific advisors, research funds, and opportunities for collaboration.

PROGRAM ACCOMPLISHMENTS

The research accomplishments of the SMLSRC in FY 2003 include 17 papers published or in press, two published book chapters, 16 presentations at national meetings, and one provisional patent application. The six research projects of the SMLSRC utilize human head-down tilt bed rest, the hind-limb unloaded rat, and cells cultured in the rotating wall vessel as ground-based models to examine the alterations caused by space flight and possible countermeasures. An additional project is designed to grow three-dimensional retinal structures in the NASA rotating wall vessel for tissue transplantation in diseases such as macular degeneration and retinitis pigmentosa.

- Cardiovascular: The cardiovascular investigators have shown that post-suspension hypotension in the hind limb unloaded rats is associated with increased levels of nitric oxide and prostacyclin. Inhibitors of the synthesis of these compounds have been shown to serve as countermeasures to the post-suspension hypotension. Culture of vascular endothelial cells in the

horizontally rotating wall vessel resulted in an increase in nitric oxide (NO) synthesis, a finding consistent with results for hind limb unloaded rats and space-flown rats. These results may be relevant to astronauts on return to Earth.

- Musculoskeletal: The beta-adrenergic system is critical to regulating the function of the cardiovascular system and cellular metabolism. The density of the beta-adrenergic receptor in plantaris (fast) and soleus (slow) muscles of rats' hind limb suspended for 30 days was significantly higher than that of non-suspended rats. Plasma xanthine oxidase activity was also higher in hind limb unloaded rats' post-suspension than in non-suspended rats, suggesting increased oxidative damage during suspension. African-American male head-down tilt bed rest subjects excreted 25-hydroxyvitamin D, the major circulating vitamin D metabolite, and 25-hydroxyvitamin D binding protein (s) into urine. There was a direct correlation between urinary 25-hydroxyvitamin D binding activity and urinary sodium and between total urinary protein and urinary sodium. This finding, which is related to the relatively high prevalence of salt sensitivity in African-Americans, may explain, in part, lower plasma 25-hydroxyvitamin D concentrations in African-Americans compared with Caucasian-Americans. A bone loss marker was significantly increased during the 7-day head-down tilt bed rest study.
- Tissue Technology: Growth factors were up-regulated in retinal-retinal pigment epithelial cells co-cultured in the NASA-designed rotating wall vessel, compared with monolayer culture. There was significant correlation between higher levels of growth factors and the complexity of tissue-like structures generated in the rotating wall vessel.

STUDENT ACCOMPLISHMENTS

The SMLSRC trained four doctoral, two medical, 30 undergraduate, and three high school students in FY 2003. There were 15 student co-authors on 12 papers and 18 student co-authors on 11 national and regional presentations. Six students presented at national meetings. Two students won first and second prizes for their space-related research presentations at the 17th Annual Symposium on Career Opportunities in Biomedical Sciences held in Nashville, Tennessee.

Faculty Awards for Research (FAR)

FAR awards provide new faculty, and those who have limited NASA experience, the opportunity to integrate the research and education components of their careers with the unique mission requirements of a specific NASA Center or JPL. The FAR program provides merit selection of proposals from outstanding and promising science, engineering, and technology (SET)-tenured and tenure-track faculty who are capable of contributing to the Agency's research and education objectives. This award provides faculty members with research support and

exposure to the NASA peer review process to enable them to demonstrate creativity, productivity, and future promise in the transition to achieving competitive awards in the Agency's mainstream research processes.

During this program year, the FAR program funded approximately 39 research projects at 14 HBCUs. The data that follow were obtained from the projects that were funded and reported during FY 2003 and summarize the activities of these FAR projects during AY 2002-03 and the summer of 2002 reporting period.

There were 187 participants in the FAR research programs of whom 99 were undergraduates, 62 were masters students, and 21 were doctoral students. Thirty-two students obtained degrees during the reporting period, including 7 bachelors degrees, 23 masters degrees, and 2 doctoral degrees.

During this period, 83 professional-level investigators were involved in research projects including 45 faculty members, 36 research associates, and 2 postdoctoral fellows. The research accomplishments of the FAR projects were documented in 76 refereed papers or book chapters that were published during this period, including 75 publications with students as authors or coauthors. Additionally, the HBCU participants made 56 presentations at peer-reviewed national and international conferences and NASA Centers with 44 of these presentations including at least 1 student presenter.

An Exemplary FAR

TUSKEGEE UNIVERSITY

Polymide-Based Nanocomposites for Affordable Space Travel

PROGRAM RELEVANCE TO NASA

The program seeks to develop new materials with revolutionary enhancements in mechanical and thermal properties. These materials are directly applicable to the next generation of spacecraft such as the reusable launch vehicle, as well as satellites.

PROGRAM BENEFITS TO SOCIETY

Society will benefit in several ways: 1) Helping NASA reach its goal of more affordable space transport will affect satellites, which will impact communication and possibly space transport of civilians, 2) Further development of nanotechnology will have a positive impact on all of society, and 3) By participating in this research, students will be trained in cutting-edge technology, thereby enhancing the quality of the Nation's future technical workforce.

PROGRAM GOALS

- Synthesize nanostructured polymeric materials using high temperature polymides
- Evaluate the structure-property relationships of these materials

- Involve students in every aspect of the research

STUDENT ACCOMPLISHMENTS

Two students who graduated with Master of Science degrees in Chemistry are currently pursuing Ph.D. degrees, one in Chemistry and the other in Environmental Engineering. A third student will receive a Master of Science degree in Mechanical Engineering in May 2004. A 2002 undergraduate in Mechanical Engineering is now working in industry. Another student will receive a Bachelor of Science degree in Chemistry in May 2004.

Mathematics, Science, and Technology Awards for Teacher and Curriculum Enhancement Program (MASTAP)

MASTAP provides opportunities for MIs to develop diverse and exemplary research-based mathematics, science, technology and geography teacher education curricula that are integrated with content from NASA's mission. Each MASTAP award recipient receives up to \$200,000 per year for a maximum of 3 years based on performance and availability of funds under the program. During FY 2003, the HBCU MASTAP awardees were Clark Atlanta University, Jackson State University, Lincoln University, Mississippi Valley State University, South Carolina State University, and the University of Maryland-Eastern Shore.

The program outcomes for the 6 MASTAP programs at HBCUs include:

- 3,635 participants in the MASTAP program: 3,060 in K-8, 150 in high school, 15 in undergraduate programs, 127 in masters programs, 1 in a doctoral program, 229 preservice teachers, and 53 inservice teachers
- 47 non-student investigators: 40 faculty and 7 research associates/assistants
- 19 presentations, all of which included at least 1 student presenter
- 10 community partnerships
- Presentations on 6 panels: 5 sponsored by NASA Minority Programs and 1 by another Federal agency

As a result of participating in these awards, students will gain awareness of career opportunities in STEM fields, exposure to NASA's mission and scientific and technical personnel role models, and will enter college pursuing NASA-related career fields.

An Exemplary MASTAP Project

CLARK ATLANTA UNIVERSITY (CAU)

CAU Partners Prepare Math and Science Teachers for Hard-to-Staff Schools

PROGRAM DESCRIPTION

The project's major goal is to recruit and prepare fully certified middle and secondary grades science and mathematics teachers to teach in designated hard-to-staff schools in the Atlanta metropolitan area. A comprehensive

recruitment mechanism is in place to recruit exceptional students to pursue teaching careers. The first cohort of students matriculated through a comprehensive standards-based curriculum that prepared them to meet the challenges of hard-to-staff (urban) schools. They are engaged in a curriculum that is standards-driven, culturally relevant and responsive, and based on best practices. The recruitment mechanism is three-fold including partnerships with the Atlanta City Public Schools, Dekalb County Public Schools, and Atlanta Metropolitan College, a 2-year HBCU. The Program provides a scholarship package including tuition, laptop computers, and travel funds. The CAU and Partners Summer Scholars Institute is for inservice teachers to enhance science content and pedagogical skills, as well as to engage in cutting-edge research. Each participant receives a stipend and Staff Development Units. The third component is the Induction Model that supports the teacher in teacher education as a preservice teacher and inservice teacher for retainment in hard-to-staff schools. Mentoring and professional development opportunities are available to participants of the program.

PROGRAM RELEVANCE TO NASA

The program supports NASA's mission to assist in increasing the number and diversity of professionals in STEM by providing qualified STEM teachers in middle and secondary schools for the children of our Nation.

PROGRAM BENEFITS TO SOCIETY

The program provides an increased number of fully certified and qualified science and mathematics teachers to the Nation's workforce in a relatively short time, provides role models for underserved populations, increases minority participation in science and mathematics, and improves the performance of students in science and mathematics.

PROGRAM GOALS

- Increase the number of State-certified mathematics and science teachers in hard-to-staff middle and secondary schools in the Atlanta public schools and Dekalb County schools.
- Strengthen the technical skills and knowledge of current middle and secondary mathematics and science teachers in these school systems.
- Enhance the CAU teacher education curricula and thereby improve mathematics and science literacy among teachers serving disadvantaged middle and secondary students.
- Create networks and support systems to retain mathematics and science teachers working in hard-to-staff schools in area school systems.

PROGRAM ACCOMPLISHMENTS

An advisory board was established consisting of 8 members representing the stakeholders from the University Departments of Biology and Mathematics, coordinators of science and mathematics for the Atlanta and Dekalb County School Systems, the Director of the Division of Natural and Mathematical

Sciences from Atlanta Metropolitan College, and the program's Teacher Education Liaison. A total of 24 students are participants in the program. The CAU and Partners Fellows Summer Institute was held on June 2-14, 2003, for inservice teachers to receive instruction on using NASA curriculum materials from a NASA education facilitator, a hands-on topography workshop from a local environmental scientist, and innovative instructional strategies in mathematics by Professor B, Inc. Teachers also engaged in research experiences in research science labs on CAU's campus and presented their work at the closing luncheon. Each teacher received a stipend and 3.0 Staff Development Units for attendance through their local school system.

Precollege Achievement for Excellence in Science, Technology Engineering, and Mathematics (PACE/STEM)

The primary purpose of PACE is to encourage the implementation of innovative projects with collaborative strategies to ultimately increase the pool of talented scientists and researchers in STEM fields. PACE awards offer opportunities for MIs, in collaboration with NASA and local school districts, to provide informal educational opportunities that will enhance the number and percentage of students enrolled in mathematics and science college preparatory courses. PACE is designed to include any combination of outreach projects such as Saturday Academies, Summer Science Camps, In-School Mathematics and Science Academies, and After-School Enrichment Programs. The program targets hard-to-staff public elementary, middle, and high schools, where 50 percent or more of the students are disadvantaged and have a large number and/or percentage of uncertified mathematics and science teachers. The following HBCUs were the FY 2003 PACE/STEM grant recipients: Alabama State University, Albany State University, Jackson State University, and Texas College. These awards are in addition to 6 PACE grants previously awarded to HBCUs.

The program outcomes for the 6 PACE programs at HBCUs include:

- 1,211 participants in the PACE program: 617 in K-8, 460 in high school, 115 in the Bridge Program, and 5 in the Undergraduate Program
- 2 publications
- 13 presentations, all having at least one student presenter
- 15 community partnerships, all of which had initiatives to increase family participation in mathematics and science-related experiences

An Exemplary PACE Project

JACKSON STATE UNIVERSITY (JSU)

Science and Technology Enhancement Precollege Program

PROGRAM GOALS

The JSU PACE project is designed for rising 7th, 8th, and 9th-grade students with a goal of increasing their potential for success in mathematics, science and engineering, and thus increasing the pool of minority students choosing careers in these fields. To realize this goal, the program has the following objectives:

- Identify and recruit rising 7th, 8th, and 9th-grade students (30 students in each group) with strong interest in enrichment programs in mathematics and science.
- Ensure that all of these students completed Pre-Algebra, Algebra, and Geometry in the 7th, 8th, and 9th grades, respectively, and that they are prepared for advanced mathematics and science courses.
- Expose the students to professionals in these areas, help them explore career options in these fields, increase their awareness of the academic preparations necessary for such careers, and contribute to their confidence in their ability to make career decisions.
- Provide intellectually challenging experiences, which are not a part of their regular school curricula.
- Enhance the interest of these students in mathematics and science through (1) role models, (2) field trips, (3) demonstrations by college faculty, (4) science fairs, and (5) Saturday Academies.
- Develop an initiative to enhance parental awareness and understanding of the educational system process, to get the parents to request that the appropriate college track courses in mathematics and the sciences are offered in the school district, help their children develop good study habits, and monitor homework assignments on a regular basis.

The project consists of a 4-week summer enrichment institute (commuter) and an academic year Saturday Academy follow-up enrichment.

PROGRAM ACCOMPLISHMENTS

Statistics for students who participated in the JSU PACE program show that 66 percent completed Pre-Algebra (compared to 48 percent in the district) in the 7th grade, and 69 percent completed Algebra in the 8th grade (compared to 26 percent in the district). Additionally, all PACE students enrolled in the prescribed college preparatory courses. Data also show that 100 percent of the PACE students have enrolled in Algebra I compared to 66 percent in the district.

STUDENT ACCOMPLISHMENTS

Integrated instruction provided the students with a greater understanding and

appreciation of the concepts. Instructors employed a discovery-based approach to student learning in which laboratories were combined with lectures, such as mathematics and science concepts, were integrated in a discovery-based laboratory setting. The communication skills instructor taught the students to report the results and in computer science the students learned how to create graphs and charts for presentations and use the Internet to gather information. This approach was used to enhance the critical and analytical thinking skills, scientific interpretation, and effective delivery and presentation abilities of the students. In all grades proposed, the students:

- Engaged in experiments and hands-on activities from a list of topics in life science, physical science, or Earth science. Utilized the writing process to complete a focused, coherent, and well organized research experiment.
- Developed well constructed paragraphs.
- Utilized dictionaries, glossaries, and other print sources to identify unknown words.
- Formulated and responded to basic research questions based on the experiment.
- Used the Internet to gather information about the experiment.
- Organized information in a systematic way that led to a logical conclusion and/or synthesis of the information. Taught pre-algebra skills and how to utilize those skills in certain components of the experiment (7th grade).
- Taught algebra skills and how to utilize those skills in certain components of the experiment (8th grade).
- Taught geometry and how to use the protractor in measuring angles (9th grade).
- Used a graphing calculator to perform scientific equations and manipulate formula.
- Collected and organized data.
- Created graphs and charts to present data for presentations.
- Created, saved, and revised documents needed for experiments.
- Planned, created, and presented an effective demonstration and PowerPoint presentation.

Model Institutions for Excellence (MIE) Program

NASA, in collaboration with the National Science Foundation (NSF), awards collaborative agreements to each institution selected for the MIE Program. Each of the chosen MIEs has a track record of awarding science, engineering, and mathematics (SEM) degrees; a strong commitment to SEM education and graduate research; and the potential for launching a major enhancement of their current efforts. The NASA-sponsored MIEs are Bowie State University and Spelman College.

Program outcomes for FY 2003 and the summer of 2002 included:

- 230 participants including 68 bridge students and 162 undergraduates
- 46 non-student investigators including 21 faculty and 23 research assistants/associates
- 7 publications in refereed journals, books, or book chapters
- 20 presentations at peer-reviewed national and international conferences
- 8 panel presentations sponsored by NASA Minority University Programs and other Federal agencies

An Exemplary MIE

BOWIE STATE UNIVERSITY (BSU)

Model Institutions for Excellence

PROGRAM INTRODUCTION/OVERVIEW

BSU is the third-oldest Historically Black College in the Nation. Approximately 87 percent of its undergraduate SEM enrollment is African American. BSU ranks first nationally among all universities in the United States in awarding masters degrees to African Americans in computer and information sciences. Due to their success, several of the MIE-sponsored programs have been expanded and are now part of BSU's overall institutional effort. Among them are BSU's computer network, the SEM student fellowship program, and a faculty research support program. BSU's MIE program is built around the results of an Educational Testing Service study of practices that succeeded in elevating the retention rate of minority students enrolled in college-level science and engineering programs nationwide. It was found that the most successful minority students had access to faculty role models from ethnic backgrounds similar to their own; peer mentors who would help students through difficulties; a demanding curriculum that is exciting and of high quality; and faculty mentors with whom they could work on research projects and get paid for doing so.

PROGRAM GOALS

- Increase STEM enrollment
- Increase and strengthen STEM retention rate
- Improve STEM graduation rate
- Increase the number of STEM students entering graduate studies
- Prepare STEM graduates for entry into relevant occupations
- Infuse information technology into the various aspects of teaching, learning, and administration

PARTNERSHIPS

Partnerships have been established to afford both students and faculty research opportunities. In some instances, the partnerships afford students an opportunity to receive academic enhancement. BSU partnerships include:

- Census Bureau
- NASA
- National Institutes of Health (NIH)
- National Science Foundation (NSF)
- University of Maryland-College Park and Baltimore County (UMBC)
- Johns Hopkins University
- Howard University
- Wadsworth Health Center
- Life Technologies and Dynamac
- George Washington University
- Argonne Laboratories
- University of Connecticut

PROGRAM ACCOMPLISHMENTS

Since 1995, the beginning of the MIE Initiative at BSU included:

- SEM undergraduate enrollment increased by 120 percent, from 340 to 976.
- Size of the SEM (first-time, full-time) freshman class increased from 58 to 170.
- Retention of first year students in SEM increased 23 points, from 52 percent to 74 percent.
- Retention of second year students in SEM increased 35 points, from 26 percent to 61 percent.
- Number of SEM students graduating per year increased by 93 percent, from 56 to 134.
- Over 265 incoming SEM freshmen have benefited from the SEM Summer Academy since 1996.
- Over 42 grants (up to 10,000 per year per grant) have been awarded to faculty members supporting research and other innovative projects on campus.
- A comprehensive SEM Tutoring and Resource Center has been established.
- A state-of-the-art computing infrastructure, consisting of over 350 computing and networking devices, has been set up in support of teaching, research, service, and administration in SEM.
- Several specialized laboratories and facilities have been established such as the Scientific Data Visualization Lab, Satellite Operation and Control Center, Natural Science Labs, and Instructional Labs.
- A widely circulated newsletter, a comprehensive SEM web site, and several important marketing materials have been developed and are regularly read by internal and external constituents.

STUDENT ACCOMPLISHMENTS

- Approximately 225 summer internships at government, academic, and corporate laboratories have been secured by SEM students.

Participation by students has led to a better understanding of their career choices and the preparations required.

- Sixty-five to 77 percent of student participants in the STEM Summer Academy move up one level in mathematics. The retention rate of the participants is 98 percent through the second year of college.
- Approximately 83 percent of the MIE Fellows enter a graduate program either as a full-time or part-time student.
- Seventy presentations (oral/poster) were presented at venues such as the Minority Access Role Models Conference in Washington, DC; University of Maryland-Baltimore Campus Research Symposium in Baltimore, Maryland; National Institute of Standards and Technology's 12th Annual Student Technical Conference in Gaithersburg, Maryland; Sigma Xi Student Research Conference in Galveston, Texas; National Conference for Undergraduate Research in Salt Lake City, Utah; and the Association for Southeastern Biologists in Crystal City, Virginia.

Partnership Awards for the Integration of Research (PAIR) into STEM Undergraduate Education

The purposes of the PAIR awards are to integrate cutting-edge NASA-related research into the undergraduate educational experience, to strengthen teaching and research strategies across academic programs, and to enhance collaboration among STEM academic departments, thereby strengthening the STEM baccalaureate degree-producing capacity of many of the Nation's HBCUs and OMUs.

During FY 2003, the HBCU recipients of PAIR awards included Clark Atlanta University, Hampton University, Norfolk State University, North Carolina A&T State University, North Carolina Central University, South Carolina State University, and Tuskegee University.

An Exemplary PAIR Project

SOUTH CAROLINA STATE UNIVERSITY (SCSU) Curriculum Enhancement Through Space Science Research

PROGRAM DESCRIPTION

SCSU has established a NASA PAIR program that has enhanced the curriculum of three of its departments through the integration of ongoing NASA research in astronomy into the curriculum. The Departments of Physical Sciences, Electrical and Industrial Engineering Technology, and Mathematics and Computer Science have developed and implemented interdisciplinary projects that introduce cutting-edge science and technology concepts, as well as inquiry-based teaching strategies into the classroom and laboratory. Several unique and innovative approaches to curriculum development have been incorporated into this project, including: (1) multidepartmental implementation of the software LabVIEW; (2) cross-

departmental, undergraduate research teams which work together under a faculty mentor for a full 12 months; (3) students' access to research-grade radio and optical telescopes; and (4) the project has partnered with the NSF-funded, Statewide Systemic Initiative to conduct outreach activities in the K-12 community such as observing sessions and planetarium programs.

PROGRAM RELEVANCE TO NASA

SCSU's PAIR project is relevant to NASA and its Strategic Plan under Mission III, To Inspire the Next Generation of Explorers, both Goal 6 and Goal 7. Goal 6 is "To inspire and motivate students to pursue careers in science, technology, engineering and mathematics." This is clearly the central theme to the SCSU project through the student research teams, faculty and student training and implementation of teaching strategies in the classroom. Goal 7, "Engage the public in shaping and sharing the experience of exploration and discovery," is satisfied through the outreach component of the project.

PROGRAM BENEFITS TO SOCIETY

The SCSU PAIR project is preparing undergraduate students, specifically underrepresented minority students, to better participate in a highly technical world. The preservice teachers and other non-STEM students have increased their scientific and technical literacy by being exposed to current ideas, technology, and methods in use in education and STEM fields. The STEM majors impacted by this project are better prepared to compete for graduate school or employment in technical fields after gaining experience with equipment, software, concepts, and methods employed in advanced STEM courses and through the student internships available through this project.

PROGRAM GOALS

- Integrate cutting-edge science and technology concepts, practices, and teaching strategies into the STEM curriculum at SCSU.
- Increase the number of SCSU STEM graduates who have been competitively trained, have discipline-related work experience, and who will attain advanced degrees in fields of interest to NASA.
- Foster cross-departmental collaborative research and curriculum activities among students and faculty members at SCSU.
- Significantly improve undergraduate teaching and learning in the technical fields at SCSU, including the use of modern teaching techniques and methodologies in introductory and advanced STEM coursework for majors and non-majors.
- Create an advisory board to include individuals from a wide range of backgrounds and experiences who will provide insight, knowledge, and professional contacts to further enhance the development of the various activities supported by this program.
- Promote faculty and student interest in NASA space science discoveries.

PROGRAM ACCOMPLISHMENTS

Significant program accomplishments during the reporting period include:

- SCSU has become a major contributor to NASA's Radio JOVE project through its continuous solar monitoring program at two frequencies and its on-line data base of solar observations (draco.scsu.edu)
- 7 faculty or faculty/student conference proceedings publications
- 3 non-refereed faculty publications
- 3 faculty proposals submitted and 2 were funded
- 10 faculty conference or seminar presentations - 13 faculty members were funded by SCSU PAIR for support ranging from travel to equipment to release time
- 209 STEM majors enrolled in courses impacted by the project
- 435 non-STEM majors enrolled in courses impacted by the project
- A new partnership has been formed with Orangeburg-Calhoun Technical College
- A new partnership has been formed with staff at the Goddard Space Flight Center (GSFC)
- Existing partnerships with scientists at NASA, a majority university, and a research institute have been strengthened

STUDENT ACCOMPLISHMENTS

Significant student accomplishments during the past year include:

- 16 student conference or seminar presentations;
- 13 SCSU students participated in the national PAIR Summit and a SCSU student won a Meritorious Presentation award at the PAIR Summit;
- 6 PAIR students who graduated in May 2003 have entered graduate school in various fields including material science, physics, microbiology, business administration, and public health.

Network Resources Training Sites (NRTS)

In 1994, the Minority University-Space Interdisciplinary Network (MU-SPIN) received its core funding from NASA to increase minority access to science and technology by improving the computer network infrastructure of minority institutions. MU-SPIN oversees 7 NRTS that serve as regional hubs that build and maintain connectivity to other minority institutions and predominantly minority-attended elementary and secondary schools.

During FY 2003, five HBCUs received continued funding of their NRTS awards. Participating HBCUs included Elizabeth City State University, Morgan State University, Prairie View A&M University, South Carolina State University, and Tennessee State University.

An Exemplary NRTS Project

Elizabeth City State University (ECSU) ECSU - NRTS Continuation/MU-SPIN NRTS Program

PROGRAM DESCRIPTION

The ECSU NRTS is designed to serve the states of North Carolina and Virginia. The NRTS provide technical training and facilitate HBCU and MI network opportunities in research and education for STEM faculty and students, as well as for the teachers of predominately minority-attended elementary and secondary schools in ECSU's region. The ECSU consortium is made up of 5 HBCUs: Bennett College, Fayetteville State University, Hampton University, Elizabeth City State University, and Norfolk State University. The University of North Carolina at Pembroke, with a student population of over 40 percent Native Americans, is also a member of this consortium. Native American students comprise 43 percent of the University of North Carolina at Pembroke, and over 70 percent of all the K-12 schools in Robeson County, North Carolina. Also in North Carolina, is Halifax County, which has schools with over 50 percent Native American populations. Each of these partner counties is classified as an Empowerment Zone/Enterprise Community (EZ/EC). Edgecombe and Wilson Counties in North Carolina, as well as Norfolk and Portsmouth in Virginia are also classified as EZ/EC communities. More details on EZ/EC communities can be found at <http://www.ezec.gov>. The research focus for the NRTS includes Remote Sensing and Earth System Science.

The Center of Excellence in Remote Sensing Education and Research (CERSER) was developed using the Institute for Collaborative Research and Education (ICRE) model. Two memorandums of understanding (MOUs) were developed to support CERSER. The first MOU was with SeaSpace Inc. in support of remote sensing research. The second MOU was with Pixoneer, Inc. in support of education and training. It is the intent of the CERSER ICRE to develop an innovative and relevant research collaboration focused on coastal, oceanic, and marine research. The CERSER ICRE is a joint effort by ECSU, the Office of Naval Research (ONR), the MU-SPIN Office of Goddard Space Flight Center (GSFC), the National Oceanic and Atmospheric Administration (NOAA), Pixoneer Inc., NOAA's Wakefield office of the National Weather Service (NWS), and SeaSpace, Inc. (the world's leading weather information provider).

PROGRAM RELEVANCE TO NASA

All projects supported by CERSER have high relevancy to NASA's Earth Science Enterprise and to NASA's commitment to provide remote sensing data from its unique space vantage point. CERSER provides research, educational and infrastructure activities in core science areas in atmospheric, oceanic, and Earth Science (AOES) and remote sensing. The goal of the

facility is to develop innovative and relevant remote sensing collaborations focused on coastal, ocean, and marine research. Projects directly related to NASA's mission include:

- Operation of a ground station and associated processing capability to acquire (by direct broadcast), record, process, and archive SeaWiFS data. (ECSU is an authorized SeaWiFS Direct Readout Ground Station for Goddard Space Flight Center).
- Two undergraduate students were supported through the ECSU Network Resources and Training Site to serve as interns for the MESSENGER program at the Johns Hopkins University Applied Physics Laboratory during summer 2003. The student interns developed their technical skills by working with experts in spacecraft integration and testing, mission design, mission operations, and mechanical support. Additional information about the MESSENGER interns can be found at <http://messenger.jhuapl.edu>, <http://muspin.gsfc.nasa.gov>, and <http://www.jhu.edu/~gazette/2003/23jun03/23briefs.html>.
- The ECSU NRTS has 5 programs funded through the Earth Science Enterprise Education Office at GSFC (two CET on-line course projects, Math of the Great Dismal Swamp, You Be the Scientist with Satellite Imagery, and Norfolk State University's Digital Earth). The initiatives are described in the Earth Science Enterprise 2002 Education Catalog.
- The Virginia-based Institute for Global Environmental Strategies has taken an important first step in creating a national infrastructure to promote on-line professional development for K-12 science educators. ECSU is one of the organizations selected by NASA's Earth Science Education Office to administer this program.
- ECSU implemented ELEM 635, a graduate course entitled, "Earth Science for Elementary School Teachers," as a part of their advanced master's degree program in Education. ELEM 635 is based on the IGES On-line Earth Science Courses developed by NASA.
- One NRTS faculty member completed a NASA Administrator's Fellowship through Glenn Research Center. NRTS has had one faculty member to participate in the NASA Administrator's Fellowship Program for each of the past 4 years. The fellow, a mathematics professor, works with Glenn Research Center to investigate a variety of new high frequency devices in communication systems. The fellow analyzes and designs a physical and mathematical model of the devices and investigates the dynamical and chaotic process and techniques for control of chaos in these models. Another professor served at Stennis Space Center during the summer of 2003.

PROGRAM ACCOMPLISHMENTS

The NRTS housed on the campus of ECSU has greatly increased its remote sensing capability. The NRTS serves as the East Coast training facility for SeaSpace, Inc. Major outcomes of the NRTS project include the installation of a TeraScan 1.5m satellite receiving system and a remote sensing training

facility. Supporting that program are two Memorandums of Agreement with SeaSpace, Inc. and Pixoneer Corporation. The MOAs provide technical and training support for the NRTS. In partnership with GSFC, the NRTS is a SeaWiFS Direct Readout Ground Station. SeaWiFS data are defined as original data from the SeaStar satellite, the SeaWiFS instrument, or information derived from these sources that has been processed, reconstructed, enhanced, or reproduced by NASA and/or its support contractors, grantees, and/or research users ECSU established the first chapter of the Institute of Electrical and Electronics Engineers-Geoscience and Remote Sensing Society (IEEE-GRSS) on the campus of an HBCU and Virginia State University established the first student Geoscience and Remote Sensing Society on an HBCU campus.

STUDENT ACCOMPLISHMENTS

Undergraduate research during the academic year and the summer of 2002 was supported by the NRTS. This includes supporting students to work in microgravity-related research at the University of Alabama. ECSU supported students working in ocean/marine science research on its campus and at three NASA Centers including Ames Research Center, Goddard Space Flight Center and Langley Research Center. Over 25 students within the NRTS consortium received scholarships and support for research efforts. Scholarships and fellowships totaling \$25,000 were distributed to students within the NRTS consortium. Student researchers received awards during the November Awards Banquet and SOARS Undergraduate Research Conference. During the summer of 2002, Virginia State University hosted Project ATOM for STEM students in the NRTS consortium.

An Exemplary NASA Partnership

Spaceflight and Life Sciences Training Program (SLSTP)

Program Introduction/Overview

The SLSTP is an academically challenging, six-week, summer program at the Kennedy Space Center (KSC) that serves a diverse student population, including HBCU students, and relies upon minority institutions, headed by an HBCU, for program execution through the NASA Academic Partner Alliance (NSAPA). The NSAPA is led by Tuskegee University and also includes South Mountain Community College (an HSI), and Diné College (a TCU). An external review panel, which met in December 2003, reported that, "The NSAPA academic partnership with minority institutions ... is exemplary," and that, "The SLSTP program is designed to provide underrepresented students with strategies for successful completion of an undergraduate STEM major and to prepare them for graduate school admissions (evening sessions on how to choose and apply to graduate schools, write essays, etc.)."

The multifaceted SLSTP experience includes experiential based learning from laboratory and field studies; tours, and lectures; strategically designed learning modules and peer/team interactions in a residential setting; skill development in conducting research; and the oral and written communication requirements of science research. The program has been responsive to the changing climate of NASA over the 19 years of its existence and well meets the 6 NASA Criteria for Exemplary Programs.

Partnerships

The SLSTP is sustainable due to the highly effective collaborative partnership between NASA personnel from several Enterprises, NASA Contractors, and NSAPA. The program is funded by the NASA Office of Biological and Physical Research, Office of Education, and Office of Space Flight. External partnerships include the US Department of Agriculture and the Canadian Space Agency. As the lead NSAPA partner, Tuskegee provides logistic operations, recruitment, and academic credit. Instructors from academia and local K-12 schools participate as counselors and mentors through another NASA program, the Summer Industrial Fellowship for Teachers (SIFT) program. NASA and all the partners recognize the value of each other's contributions.

Diversity

The SLSTP reaches target groups on a consistent basis. One major focus of the program has been to bring together a diverse group by region, ethnicity, and gender. Of the 672 SLSTP alumni, 151 have been African Americans, 79 Asian Americans, 67 Hispanic Americans, and 19 Native Americans. Students have represented all 50 states plus Puerto Rico and the Virgin Islands. In recent years, Canadian students have been included as well, sponsored by the Canadian Space Agency. Over half of the students have been female. Students participating in SLSTP gain an appreciation of the diversity that exists within the USA. For example, in the 2003 SLSTP class, the following were represented:

- | | |
|----------------------|------------------------|
| • 18 ethnic groups | • 18 females |
| • 10 languages | • 11 males |
| • 15 academic majors | • Regions of the USA – |
| • 6 HBCUs | West, Southeast, |
| • 2 HSIs | North, Northeast, |
| • 1 Tribal College | Northwest, West |

The academic partnership enhances diversity in student and project counselor recruitment for the SLSTP. Recruitment involves mailings to all HBCUs, HSIs, TCUs and Land Grant Institutions and visits are typically made to 25-30 minority institutions. This program reaches applicants at minority conferences such as the National Society for Black Engineers, Society for the Advancement of Chicanos and Native Americans in

Science, Minorities in Agriculture, Natural Resources and Related Sciences, and the American Indian Science and Engineering Society.

Content

Program Goals:

- Increase the workforce diversity so that the pool of scientists and engineers eligible to pipeline into the Agency reflects the US population
- Involve undergraduates nationwide, targeting underrepresented groups
- Introduce students to the research process and Space Life Sciences research
- Create dialogue between government, academic and commercial NASA partners
- Have SLSTP alumni act as NASA ambassadors

SLSTP provides students with the opportunity to work in cross-disciplinary projects and equips students to effectively deliver scientific information in a professional forum. To these ends, the NSAPA academic alliance successfully designed a responsive academic environment that weaves the experiential-based learning provided by the Dynamac Corporation in the laboratories, field sites, tours, and lectures with the learning gained from peers and the NSAPA in strategically designed learning modules and interpersonal interactions. An integral part of the SLSTP is a roundtable discussion on diversity during which students and staff exchange information and experiences relative to their varied backgrounds. The program was developed to involve students and the SLSTP partners in projects that help “To Understand and Protect Our Home Planet, To Explore the Universe and Search for Life, and to Inspire the Next Generation of Explorers as Only NASA Can.”

Customer Focused

The SLSTP makes direct use of NASA content, people, and facilities when students and staff spend 6 weeks immersed in NASA research while using the laboratories and field research sites at KSC. Active involvement of NASA researchers assures the scientific and technical accuracy of content for all activities. Many aspects of the research are specific to KSC and its facilities, especially those related to flight experiment processing and the ecology issues present at KSC. The program is unique in providing NASA research experiences at the site of all US human space launches. An integral part of this program is the introduction of students to the rich history of the US Space Program through field trips.

The SLSTP also demonstrates how space research affects our lives. For example, the Impedance Threshold Device (ITD) was developed by one of the SLSTP Principal Investigators and tested for several years as SLSTP projects. The ITD has applications for the military for combat use, as well as for elderly patients. The ecology group, which utilizes the unique

environment of KSC, is involved in research on environmental monitoring methods which have broad applications for Earth and Space Science.

Pipeline

SLSTP reaches target groups. Generally, the students indicate that SLSTP enhances their desire to work in the space industry and provides them with avenues to achieve this goal. The alumni recognize the program as a valuable networking tool. Evidence of this is the external development of an SLSTP Alumni List Serve and the formation of an SLSTP Alumni Association. Many of the minority students have obtained graduate degrees in STEM; have been involved in other NASA student programs; or have gained employment with NASA, NASA contractors, or academia—continuing space related research. The SLSTP is a NASA pre-employment scientific and technical program and serves as a pipeline to the Astrobiology Academy, Undergraduate Student Research Program (USRP), Graduate Student Research Program, and the NASA Specialized Center of Research and Training (NSCORT). It also provides a pipeline for students from NASA programs such as the Student High School Apprenticeship Research Program (SHARP) and NSCORT. Lecturers are recruited from academia and companies that are involved in NASA-related efforts. The PIs represent academia, NASA contractors, and other government partners. In the 2003 SLSTP, a workshop on the various NASA education programs offered at KSC was incorporated into the curriculum.

Evaluation

Student participants and PIs evaluate SLSTP regularly using Likert-scale surveys. Opportunities are provided for open-ended comments, both written and verbal, to be made by the students and the PIs. Annual Headquarters reviews are held and recently an external panel reviewed the program. The program uses feedback from these sources to make adjustments to ensure it remains in line with the goals of NASA and is customer-focused. In addition to these evaluations, success is determined by tracking alumni achievement in academia and employment.

NASA CENTER AND ENTERPRISE INVOLVEMENT

During FY 2003, the NASA Centers and Enterprises implemented numerous projects that helped to strengthen the infrastructure of HBCUs. These projects better equipped students to pursue degrees and careers in NASA-related fields. The faculty at HBCUs enhanced their ability to conduct NASA-related research and compete for mainstream funds. The following summaries are synopses of the accomplishments of the NASA Centers and Enterprises for FY 2003 pursuant to Executive Order 13256. This Executive Order requires all Federal agencies to plan and report annually on how they increased the capacity of HBCUs to compete effectively for Federal funding.

Ames Research Center (ARC)

ARC strives to foster and develop meaningful research collaborations in NASA-related research areas that are both beneficial to NASA and provide HBCUs the ability to enhance their research capabilities. ARC is unwavering in its commitment to strengthen its support of institutions of higher education to ensure that NASA can meet its future workforce needs in STEM fields.

In FY 2003, collaborations with HBCUs resulted in \$887,843 awarded in research and development grants, cooperative agreements, and third-party subcontracts from ARC discretionary funds. Although ARC-sponsored research at HBCUs declined this year, the Center's commitment of support to these institutions' faculty and students is evident in the increased amount of students and faculty participating in ARC-related research, internships, and fellowship opportunities. FY 2003 was the first year of the NAFEO/MSI/NASA Ames Research Academy located in the NASA Research Park (NRP). ARC hosted 6 faculty members representing 5 HBCUs, 9 undergraduates, and 1 graduate student from various HBCUs. In FY 2004, ARC's Office of Education assumed the responsibility of technical oversight of the cooperative agreement that supports the Academy's presence within the research park, allowing greater connectivity to Ames.

Dryden Flight Research Center (DFRC)

DFRC's exciting research and operations provide a unique asset for NASA to fulfill its mission to ***"Inspire the next generation of explorers."*** To accomplish this mission, DFRC established the Office of Academic Investments (OAI) as a unifying entity responsible for leading the implementation of all of DFRC's educational programs. OAI aspires to support NASA's Education Programs, Aeronautics, and Earth Science themes through its research and flight capabilities. Using DFRC's unique assets in FY 2003, students, educators, and researchers from HBCUs were able to conduct engineering and scientific investigations in support of its research and education mission.

During FY 2003, DFRC funded a total of \$431,199 to HBCUs. The following categories of programs were funded:

- R&D - 2 HBCUs participated in the FAR program.
- Fellowships, Internships, Recruitment, and Arrangements under IPAs – Every year DFRC operates a high school fellowship program, SHARP, 8 undergraduate and graduate internship/fellowship programs, including a volunteer program, a faculty program, and a number of IPAs.
- Student Tuition Assistance, Scholarships, and Other Aid – In FY 2003, DFRC hosted one co-op student from North Carolina A & T State University; one student from Alabama A&M University participated in the Undergraduate Student Research Program; and a student from Spelman College enrolled in the WISE program (Women in Science and Engineering Scholars Program).

Glenn Research Center (GRC)

In FY 2003, GRC awarded research grants to HBCUs totaling \$5,370,000. In the area of training, internships and other aid, GRC awarded HBCUs \$95,400.

GRC also provided \$1,230,000 in third-party funding to Minority Access, Inc. and the National Action Council for Minorities in Engineering (NACME) for their collaborations with HBCUs in support of the development of students in NASA-related disciplines.

GRC hosted its annual HBCU Research Forum in FY 2003. This event afforded an opportunity for researchers at HBCU's across the Nation to present summaries of their research interests and capabilities to GRC technical managers. The HBCU researchers were given briefings on the GRC R&D agenda. Additionally, time was scheduled for informal discussions on future collaborations. This annual forum is an exemplary vehicle for building partnerships that are sustainable and critical for GRC's achievement of its R&D goals.

GRC proactively recruits students from HBCU's for summer work experiences. The GRC internship program provides students with introductory professional experiences to complement their academic programs. Interns are given assignments in R&D, technical, and administrative projects under the personal guidance of NASA professional staff members. GRC hosted students from HBCUs in the program during the summer of FY 2003.

Through an FY 2003 grant to Tennessee State University, GRC supported precollege students in a 2-week long on-campus program, College Bound; precollege students for a pre-engineering enrichment program, MITE; and undergraduates in pursuit of technical degrees in the College of Engineering and Technology. These programs were designed to increase the number of underrepresented minorities who graduate with engineering degrees.

GRC continued a robust K-12 education initiative, the Science, Engineering, Mathematics, and Aerospace Academy (SEMMA) program, which prepares the next generation of students motivated to enter the NASA pipeline and pursue STEM careers. Through Paragon Tech, Inc., the National SEMMA Office, GRC-funded SEMMA sites at the University of Maryland-Eastern Shore, Morgan State University, the University of the District of Columbia and Winston-Salem State University. These HBCU SEMMA sites served over 4,700 students and parents during FY 2003.

Goddard Space Flight Center (GSFC)

During FY 2003, GSFC continued efforts to enhance its relationships and interactions with HBCUs. GSFC maintained an energetic outreach program to minority institutions, particularly those within its geographical region.

GSFC awarded \$4,455,524 to HBCUs during FY 2003.

The Equal Opportunity Program Office

GSFC sponsored a series of internship programs with HBCUs. Students enrolled in these institutions came to GSFC for a period of 8-12 weeks over the summer to conduct research and administrative activities under the supervision of GSFC personnel.

- Bowie State University - cosponsored 26 undergraduate and graduate students.
- Florida A&M University - hosted 6 interns for the Increase Minority Access to Graduate Engineering (IMAGE) program.
- Morehouse College - hosted 8 interns in the Strategic Preparedness for Advancing Careers in Engineering (SPACE) program.
- Spelman College - hosted 7 interns in the Women in Science and Engineering (WISE) program.
- Howard University - hosted 4 interns in the Public Service Intern (PSI) program.
- New effort was placed upon interactions with other Center internship programs toward ensuring a diverse pool of applicants from which to draw.
- A researcher at Coppin State University participated in the NASA Faculty Fellowship Program. The interaction led to funding from the Earth Science Directorate for an unsolicited proposal to continue the collaborative research and curriculum enhancement begun in the summer.

The Education Office

The Education Office at GSFC has been involved in the development of collaborative efforts for underrepresented populations through partnerships with Morgan State University in a variety of programs, namely the facilitation of engineering competitions. The Education Office also provided support for a middle school girls' program to promote STEM curricula for females at Morgan State University.

The Earth Science Directorate

The Earth Science Directorate supported the atmospheric science programs at Howard University by mentoring students, advising degree candidates, advising students in graduate studies, and teaching core courses in atmospheric science. Programs

supported include: 1) the Center for the Study of Terrestrial and Extraterrestrial Atmospheres (CSTEa) program, which supported faculty and both undergraduate and graduate students in atmospheric science academic and research activities; 2) the Howard University Program in Atmospheric Science (HUPAS), which is a masters of science and Ph.D. program; and 3) Goddard Howard University Fellowship in Atmospheric Science (GoHFAS), which supports undergraduate students in their final 2 years, gives them summer research experience, and encourages them to enroll in graduate studies in the hard sciences.

The Space Science Directorate

The Space Science Directorate continued to interact frequently with the HBCU community. The Director of Space Science visited Hampton University, Norfolk State University, Xavier University, and Southern University during FY 2003 to develop professional relationships and encourage student and faculty involvement with GSFC, especially through the GSFC Scholars in Space Science co-op program.

- Scientists at the Laboratory for High Energy Physics are engaged in a research collaboration with faculty at Norfolk State University (NSU). The project involves the analysis and interpretation of measurements obtained by the Japan/United States Balloon Borne Experiment with a Superconducting Spectrometer (BESS). The work at NSU in FY 2003 focused on understanding the performance of the BESS instrument and on the analysis of data obtained during the ascent phase of a BESS flight to determine the spectra of protons and light atomic nuclei as a function of atmospheric depth.
- GSFC scientists collaborated as co-investigators on a proposal with Howard University in response to NASA's research announcement, "The Minority University and College Education and Research Partnership Initiative in Space Science (MUCERPI) 2003." The proposal collaborators included the Departments of Physics and Astronomy, Chemistry, and Mechanical Engineering at Howard University and GSFC's Space Science Data Operations (SSDO) office to provide specific research projects and internships at GSFC for Howard University students and faculty. A GSFC scientist also continued work with the National Society of Black Physicists (NSBP), served as a panelist at the 2003 NSBP national meeting, and spoke at the first annual NASA Science Week at Bennett College.
- A Laboratory for Astronomy and Solar Physics scientist continued as an advisor for development of the astronomy program at Tennessee State University.
- The Laboratory for Extraterrestrial Physics implemented a plan with Morgan State University to bid a reconfigurable architecture based on microelectromechanical systems in the FAR program.
- The SSDO office worked with Medgar Evers College faculty on its Minority University Initiative grant. A representative of the SSDO office, helped Medgar Evers faculty to get content for their space science courses which were started and continue to be

developed, and aided in finding summer jobs for students at GSFC, and in providing support for the College's successful follow-on proposal to the NASA MUCERPI grant program. In addition, a GSFC scientist chaired the meeting of the advisory board for the final year of the South Carolina State University PAIR program.

The Applied Engineering and Technology Directorate

- Morgan State University (MSU) was awarded a University Research Center (URC) grant for funding start-up in Calendar Year 2003. This URC is the Center for Advanced Microwave Research and Applications (CAMRA) and will provide support to NASA's Applied Engineering and Technology Directorate (AETD) at GSFC. The Center is operated through MSU's School of Engineering.
- The AETD provided technical management for 2 FAR grants to HBCUs: Alabama A&M University and Morgan State University.
- The AETD Guidance, Navigation, and Control and Mission Systems Engineering Branch at Wallops Flight Facility (WFF) has entered into an informal agreement with the University of Maryland-Eastern Shore (UMES) that allows mutual benefit to NASA and to UMES. The fundamental intent of UMES' Capstone Project for seniors is to provide "real world" engineering design and implementation experiences for students as part of their senior design requirement. AETD is cooperating by integrating student development efforts with current technology interests of AETD. This allows the students to participate in actual technology applications while fulfilling academic requirements.
- The Graduate Student Information Technology Initiative (GSITI) is an effort to grow real-time processing skills at WFF. The intent of the GSITI program is to capture local real-time processing student talent for employment with the University of Maryland Eastern Shore. Students use NASA research opportunities as their master's thesis and gain work experience while NASA benefits from seeding local students' skills for employment after graduation. Discretionary Funding is utilized to support the program.

The Independent Verification and Validation (IV&V) Facility

- A program which began with Alabama A&M University addresses the critical issue of the credibility of testbeds used in the verification of software requirements specifications. The goal of this R&D effort is to propose acceptable guidance and practices for certifying simulations that are used as software requirements testbeds for NASA programs and projects with major software-critical components.
- In another R&D effort with West Virginia State University (WVSU), a project is underway to examine the current practices of the NASA IV&V Facility in hopes of identifying a means of establishing a mutually beneficial ongoing partnership between WVSU and the NASA IV&V Facility.

Jet Propulsion Laboratory (JPL)

JPL performs research, development, and related activities for NASA. The primary mission of the Laboratory is to explore the solar system with automated spacecraft. In addition, JPL undertakes other scientific, technological and education projects to meet the national needs. JPL is fully committed to NASA's goals in support of HBCUs which comply with Executive Order 13256. The Laboratory continued to implement programs to achieve the goals of strengthening the capability of HBCUs to provide quality education, and to conduct first-rate research activities for faculty and students. Moreover, JPL perceived a need to initiate a more proactive policy in its role as technical monitor, seeking out opportunities to more closely link funded programs to the technical divisions and to broad education and public outreach efforts. The total funding for awards to HBCUs during FY 2003 was \$225,238.

During FY 2003, the significant contributions to HBCUs included the following:

- In 2003, JPL hosted a career fair, conducted tours of the JPL facility, and facilitated two workshops in support of the National Society of Black Engineers Annual Conference. Approximately 270 students and professionals participated in the workshops and tours.
- One student supported with JPL direct funds, a Tuskegee University graduate, was converted to a hire.
- JPL supported North Carolina A&T State University's research efforts under subcontract agreements.
- JPL co-sponsored the annual conference for the Harriett G. Jenkins Predoctoral Fellowship Program and the NASA Administrator's Fellowship Training and Conference with DFRC. The Conference hosted 125 fellows, NASA Center staff, as well as several invited guests, and was held in Washington, DC to ensure the support of the NASA Administrator.
- The Navigator Mission piloted a summer research program beginning in 2003. The partner for the 8-week 2003 summer program was Tennessee State University (TSU). TSU maintains a vibrant astronomy and astrophysics program. The Navigator-sponsored summer program included a 7-week research program based on an expanded version of one of the projects from the Navigator Program's Michelson Summer School. Students began with a 3-week review of optics, telescopes, and CCD-cameras. Students participated in several hands-on experiences including an observing run. The eighth week was spent at JPL, where they presented their study projects to JPL scientists. The students also became familiar with the Lab's operations and employment opportunities (JPL employs over 500 students every summer in various capacities working with technologists and scientists). Future summer programs will explore opportunities for participants in the JPL summer program.

Johnson Space Center (JSC)

JSC aggressively sought new relationships with HBCUs and worked to strengthen existing ones in aiding in the development of competitive aerospace research capabilities at these institutions. Total FY 2003 HBCU funding was \$894,492, which represents a 5.6-percent increase over FY 2002 funding of \$844,244.

During FY 2003, JSC accomplished the following in support of the NASA Education Enterprise Strategic Plan to support higher education and underrepresented and underserved communities:

- Provided technical and administrative support to 4 URCs: Morehouse School of Medicine Space Medicine and Life Sciences Research Center; Tuskegee University Center for Food and Environmental Systems for Human Exploration of Space; Prairie View A&M University Center for Applied Radiation and Research; and the Texas Southern University Research Center for Biotechnology and Environmental Health.
- JSC senior management continues to support the NASA Administrator's Fellowship Program (NAFP), which is designed to enhance the professional development of NASA employees and faculty at minority-serving institutions that provide instruction and/or conduct STEM research. One civil service NAFP fellow was supported in FY 2003. The fellow was assigned to Prairie View A&M University for 9 months in the Department of Computer Science and was instrumental in assisting the students with their proposal for the KC-135 flight program. In FY 2003, three proposals were submitted and two were accepted for flight. The fellow is a research program manager in the International Space Station Payloads Office.
- Continued support to the Harriett G. Jenkins Predoctoral Fellowship Program. One fellow was mentored by scientists in the Space and Life Sciences Directorate. Also, one JSC civil servant served on the application review committee.
- Thirty-four college students from minority institutions and programs for students with disabilities interned at JSC during the summer of 2003. The undergraduate and graduate-level interns were selected based on achievements in programs funded by NASA. Students were mentored by staff in Procurement, Mission Operations, Engineering, Information Systems, Center Operations, Chief Financial Officer, and Space and Life Sciences.

Kennedy Space Center (KSC)

In FY 2003, the academic partner for the Spaceflight and Life Sciences Training Program (SLSTP) was Tuskegee University, which is partnering with the NJ-NASA Specialized Center of Research and Training (NSCORT), South Mountain Community College, and Diné College to perform their functions. This grant was jointly funded by three partners from NASA Headquarters: Division of Life Sciences (Code UL), the Office of Space Flight (Code M), and the Education Enterprise (Code N). The 2003 SLSTP program provided a 6-week training program for 30 students selected from around the United States. The principal purpose of the program is to use the exciting

and unique resources of KSC to expose bright, diverse undergraduate students to the possible career paths available in NASA's Life Sciences and Engineering disciplines. The SLSTP has been at KSC since 1985.

Florida A&M University Program IMAGE (Increasing Minority Access to Graduate Engineering) is a scholarship program made possible with a grant from NASA Headquarters. Financial and academic support is provided for participants through their undergraduate years of study, and upon graduation, they are offered assistance in pursuing graduate study and employment. Students are given the opportunity to work as interns at KSC and other NASA Centers, for 10 weeks during the summer, providing the students with hands on, challenging experiences that stimulate continued interest in the fields aligned with NASA's research mission. KSC manages this program for NASA.

The KSC Education Office continued to support a staff member who worked under the Intergovernmental Personnel Act (IPA) in FY 2003, whose responsibilities included reaching out to minority universities to explain KSC's research needs. Working through the Space Grant consortia and other venues, a list of KSC's research needs was disseminated to all member colleges and universities to provide them with a better understanding of KSC's technical needs. This data could then be used in applying to various NASA programs and projects. Colleges and universities were also contacted regarding a competitive KSC announcement for additional internships and research opportunities.

KSC participated in the 2003 NASA Research Summit, which was heavily attended by minority universities. KSC provided a panel presentation on how technical requirements are determined at the Center, what the current technical requirements were, and demonstrated two successful partnerships to provide tangible examples of how partnerships work at KSC. The final presentation provided an example of evaluation data on one of KSC's key university programs so that participants could see how programs are evaluated. A result of this panel presentation was a request from the NASA-funded URCs to visit and learn more about KSC.

KSC also presented technical requirements and areas of opportunity to the Minority University Space Interdisciplinary Network in 2003. This group of minority universities is committed to training the next generation of minority scientists and engineers. This meeting was one of a series of meetings to reach out and inform the minority university community about KSC activities and opportunities.

The operation of NASA's Education Programs, located at the Center for Space Education facility at the John F. Kennedy Space Center Visitors' Complex, continued by a cooperative agreement with Bethune-Cookman College. This agreement provided services to teachers, offered NASA-sponsored programs for students and teachers in the Exploration Station located at the Center for Space Education, and provided support to the KSC Education Programs and University Research Division.

KSC's Education Division has continued its proactive effort to communicate information to minority institutions regarding NASA's Minority University Research and Education Program offerings. In 2002, KSC issued an announcement of opportunity for student internship programs and awarded grants to four institutions, including two HBCUs -- Alabama A&M University and Bethune-Cookman College. A total of 36 interns from these universities participated in a 10-week internship at KSC during the summer of 2003.

The contract administration for the management of the Summer Faculty Fellows program was completed in FY 2003. A partnership between the University of Central Florida and Florida A&M University won this award with a value of \$986,000 over 3 years.

KSC offers internship opportunities to numerous students annually, giving them the opportunity to work side-by-side with NASA scientists and engineers. During the summer of 2003, approximately 96 university students participated in internships of which 42 represented minority universities (43 percent). In KSC high school programs, 31 of 46 students were minority students (66 percent). In the SLSTP, 11 minority institutions were represented out of the 28 institutions.

Approximately 150 KSC summer interns, many of whom were minority students representing minority institutions, were funded to participate in a Career Planning Symposium held in Cocoa Beach, Florida. Speakers provided career planning, financial planning, job search, and interview techniques including a motivational speaker as the keynote speaker. Members of the KSC community also attended and provided additional career advice.

KSC awards to HBCUs for FY 2003 totaled \$2,323,366.

Langley Research Center (LaRC)

LaRC has pursued initiatives that continue to support previously developed relationships with HBCUs. Through Third-Party Awards, LaRC has supported Hampton University with two projects in atmospheric sciences and remote sensing science instruments. Additionally, the Office of Education has provided a wide selection of projects that range from undergraduate preservice teachers, university students and faculty, and general outreach activities. LaRC's commitment to and support of HBCUs was further evidenced as follows:

- **Pre-Service Teacher Program (PSTP)**
The NASA Langley PSTP is a partnership between the Langley Office of Education and Norfolk State University's School of Science and Technology. The goal of the program is to provide preservice teachers and faculty members the opportunity to enhance their knowledge and skills in teaching mathematics and science using technology at the elementary and middle school levels.

- Pre-Service Teacher Institute (PSTI)
PSTI is an intensive 2-week residential program, which served approximately 45 preservice teachers during two sessions in FY 2003.
- Langley Aerospace Research Summer Scholars (LARSS) Program
The LARSS program represents a diverse group of competitively selected undergraduate juniors, seniors, and first-year graduate students who are pursuing degrees in aeronautical engineering, mechanical engineering, electrical engineering, materials science, computer science, atmospheric science, astrophysics, physics, chemistry, or selected space disciplines of interest to LaRC. Five HBCUs participated: Elizabeth City State University, Hampton University, Lane College, Norfolk State University, and North Carolina A&T State University.
- NASA Faculty Fellowship Program (NFFP)
The NFFP, previously known as the American Society for Engineering Education (ASEE) Summer Faculty Fellowship Program (SFFP), is a coordinated effort between Hampton University, Old Dominion University, and LaRC. Two HBCUs were represented, Langston University and Norfolk State University.
- Distance-Learning Recruitment Activities
The use of videoconferencing is a new approach that LaRC's Office of Education used for FY 2003 to recruit participants from various universities. The three universities involved in the distance-learning recruitment efforts were HBCUs: Hampton University, Norfolk State University, and Langston University.

The LaRC Office of Education (OEd) made a concerted effort to increase minority participation in all of its programs. Listed below are additional activities that widely increased its outreach to HBCUs.

- OEd representatives attended the 19th Annual Cooperating Hampton Roads Organizations for Minorities in Engineering (CHROME) Star Awards presentation in December 2002. Over 450 CHROME club students attended the awards ceremony. There are approximately 3,100 student members in the Hampton Roads, Virginia area.
- An OEd representative attended the North Carolina Central University Administrator Fellows Annual Conference held January 29, 2003, in Durham, North Carolina.
- OEd staff participated and exhibited at the Louis Stokes Minority Alliance Annual Conference held February 17-19, 2003, at the City College of New York.
- An OEd representative visited Winston-Salem State University's Science and Technology Department in Winston-Salem, North Carolina, on February 12, 2003.
- OEd staff participated and exhibited at the National Society of Black Engineers (NSBE) annual conference held in March 2003 in Orlando, Florida.

- Attended the Governor's Hi-Tech Minority Conference in Richmond, Virginia, on March 14, 2003.
- The Eighth Annual NASA/Norfolk State University Pre-Service Teacher Conference was held March 27-29, 2003, at the Hilton Alexandria Mark Center in Alexandria, Virginia.
- Attended Norfolk State University Cluster Meetings during the spring and fall of 2003.
- Attended the Annual Minority Leadership Conference in Roanoke, Virginia, on August 2-5, 2003.
- OEd representatives attended the "Emerging Leaders' Conference" in Roanoke, Virginia in August 2003. Thirty HBCUs were represented at the conference and 80 of the top academic HBCU students from across the Nation were in attendance.
- OEd staff participated and exhibited at the National Technical Association (NTA) Conference held September 9-13, 2003, in Orlando, Florida.

LaRC awarded \$1,791,000 to HBCUs in FY 2003.

Marshall Space Flight Center (MSFC)

MSFC attained the following objectives for FY 2003:

- Improved the obligations and costing performance on HBCU grants;
- Worked with the institutions to increase the number of students benefiting from summer internship programs; and
- Assisted Center program and project offices in identifying additional areas where HBCU's can contribute to mission success.

MSFC funding to the following HBCUs supported faculty and student research, infrastructure improvements, faculty development, internships, and tuition assistance:

- Alabama A&M University
- Alabama State University
- Jackson State University
- Morehouse College
- Morgan State University
- North Carolina A&T State University
- Oakwood College
- Spelman College
- Stillman College
- Tuskegee University

MSFC awarded \$4,716,155 to HBCUs in FY 2003.

Stennis Space Center (SSC)

HBCU faculty who participated in the NASA Faculty Fellowship Program (NFFP) at SSC have been quite successful in obtaining NASA grants based on the training and experiences gained during their tenure in the NFFP at SSC. Of the 11 personnel participating in the NFFP during FY 2003, 6 or 54 percent were from minority universities; 4 or 36 percent were HBCU faculty, 1 or 9 percent was from an OMU which has a predominantly African American student population, and one from an HSI. Of those 11 participants, 4 or 36 percent were minorities including 1 African American. These statistics are fairly similar to last year and SSC continues to have one of the best records in the Agency for minority university involvement in its NFFP. Many of the summer faculty over the 14 years the program has been at SSC became familiar enough with the SSC missions that they were able to write successful proposals that were funded by NASA Research Announcements (NRA). Of the \$2.75 million invested in the NFFP at SSC over the years, participating fellows have gone on to obtain well over \$5.8 million of NASA funding traceable to the contacts made and knowledge gained while at SSC. The vast majority of this was by the professors from minority universities. During FY 2003, SSC also hosted its first NAFP Fellow, who is an environmental chemistry professor from Alcorn State University and an African American.

Programs for undergraduate students at Spelman College (WISE), Morehouse College (SPACE), Florida A&M University (IMAGE) and other Agency programs that include students from HBCUs, are well implemented at SSC. Of all college-level summer student programs at SSC in FY 2003: 60 percent were minorities; 49 percent were women; 9 percent had self-identified disabilities; 57 percent were from minority institutions; and 44 percent were specifically from HBCUs. Of the co-ops, 20 percent were minorities (13 percent African American and 6 percent Asian). Over 33 percent of all graduate student-level Agency fellowships and internships including: Graduate Student Researchers Program (GSRP), Harriett Jenkins Predoctoral Fellowship Program, and Office of Space Flight-sponsored programs) through the SSC are held by minority students, with 20 percent of all such fellowships being from minority institutions. SSC also hosted a Pre-Service Teacher Institute in FY 2003 with 100 percent minority institution participation and 72 percent of the students from HBCUs.

SSC employees visited each of the minority institutions with which SSC has an active project. Additional visits were made to acquaint other HBCUs with NASA's mission interests and desire to recruit students and/or faculty to participate in programs and respond to NRAs and Cooperative Agreement Notices. Civil servants and contractors also dedicated much time in mentoring the HBCU students and in collaborating with their faculty when these individuals spent time on-site with programs at SSC. SSC civil servants and the NASA/NAFEO Louis Stokes Fellows participated in and gave presentations at a number of minority-focused special emphasis conferences and workshops. SSC also worked with more than a dozen MUREP-funded projects at

HBCUs during FY 2003 and collaborated with five of those institutions to offer remote sensing and Geographic Information System (GIS) technology workshops.

Although no funds were granted directly to HBCUs for fellowships and internships, SSC hosted five Spelman College students in the WISE program, 1 Florida A&M University student in the IMAGE program, two students from the NACME program, 2 students through the Minority Access program, and 4 other students from HBCUs in various other programs.

SSC awarded \$1.5 million to HBCUs in FY 2003 of which 80 percent (\$1,219,258) supported research and development at these institutions.

Office of Space Science (OSS)

Office of Space Science (OSS) support of HBCUs in FY 2003 was dominated by the award of \$13.7 million to Hampton University in order to carry out its responsibility as the lead institution for a Small Explorer (SMEX) Program flight project, and by the continuation of space science capability development grants to six HBCUs under the Minority University Education and Research Partnership Initiative in Space Science.

Research and Development

NASA's Space Science Enterprise is the primary organization responsible for carrying out NASA's goal to "explore the solar system and the universe beyond, understand the origin and evolution of life, and search for evidence of life elsewhere." It pursues these areas through a portfolio of programs and projects that provide opportunities for universities, laboratories, and other domestic institutions to openly compete for awards to conduct space science flight missions or research projects. As a result of such a competition held in FY 2001, Hampton University became the first HBCU to be awarded lead responsibility for an entire space flight mission. In FY 2003, Hampton University received \$13.7 million in order to begin the development phase of its Aeronomy of Ice in the Mesosphere (AIM) mission. Hampton's AIM mission has a total award value of \$102 million over 7 years (FYs 2001-2007), of which \$57.5 million will be procured directly to Hampton.

Training

The Minority University College Education and Research Partnership Initiative (MUCERPI) in Space Science offers minority universities an opportunity to develop academic programs and/or faculty and student capabilities in space science through close partnerships with major space science research groups. The capabilities developed under this initiative may include research, undergraduate or graduate courses or degree programs, precollege or public outreach programs, and/or teacher training in space science.

In FY 2003, six HBCUs first funded in FY 2001 under this initiative, completed the planned 3-year period of their awards. Analysis of outcomes self-reported by the grantees indicated that the MUCERPI program is succeeding in enhancing the ability of

HBCUs to offer opportunities in space science to their students and to the communities they serve. Collectively, the grantees from these institutions are engaged in research collaborations with 8 NASA space science missions or suborbital projects and in 23 working partnerships with major space science research groups. In academic programs, they have established on their campuses 9 new or redirected space science faculty positions, 2 new or revised space science degree programs, and 20 new or revised space science courses with a total enrollment to date of over 300 students. They also engaged in a wide variety of teacher training, precollege outreach, and public outreach programs.

In FY 2003, the OSS awarded \$1,349,998 to HBCUs and of that amount \$1,277,098 (95 percent) was obligated.

Office of Biological and Physical Research (OBPR)

The OBPR continues to move forward in its commitment to increase involvement with minority universities by broadening minority university participation in the OBPR research programs.

The OBPR, in collaboration with NASA's MUREP, supports awards that enhance research and academic infrastructure and expand faculty and student involvement in the NASA research and education community. These awards include teacher and student preparation programs, undergraduate and graduate student support, all of which focus on OBPR-related disciplines.

There are currently several HBCUs involved in research that is crucial to NASA's mission. Within the Advanced Human Support Technologies Program, there are three HBCU institutions contributing to the Advanced Life Support Element. Among them, they have 5 grants including the NASA Specialized Center of Research and Training (NSCORT) at Purdue University, which is teamed with Howard University and Alabama A&M University. In addition, Tuskegee University has 4 smaller grants. Together, these universities are working on issues related to a closed, regenerative life-support system such as food production and recycling of wastes. The Morehouse School of Medicine is involved in 4 grants addressing the Physiology and Behavior and Performance Elements of the Biomedical Research and Countermeasures Program. These efforts are seeking solutions to the effects of long-duration space flight on humans such as decreased immunity to diseases and physiological degradation. Morehouse is one of the members of the National Space Biomedical Research Institute, which received funding from the Bioastronautics Division. All of these activities target the development of a pipeline of minority group science students as an important part of what they are about.

In FY 2003, the Academic Partner Alliance for the SLSTP was Tuskegee University, which is partnering with both an HSI and a Tribal College.

Within OBPR, both the Educational Outreach and Public Outreach programs rank as a top priority to increase the reach to non-traditional and minority populations.